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EMPLOYERS in any part of the world who require the services of superintendents, mining or civil engineers, metallurgists, chemists, mine or furnace foremen, or other assistance of this character, can have their wants advertised in the ENGINEERING AND MINING JOURNAL without charge.

THE Kingdom of Saxony, which owned already some of the principal mines in the Freiberg District, has now purchased all the rest, and will establish a central management for the whole district. This will keep the industry alive, by using the profits of the best mines to continue exploring work in mines not now profitable. The state can afford to do this; for it owns the two great smelting-works in the neighborhood of Freiberg, and derives from them a revenue which would cease if the product of ore in the district were allowed to stop. Our Freiberg friends are much pleased with the change; and we have not the heart to dissent, though a sound political economy may condemn this state ownership. The ancient and famous mining industry of the district might well reply to such a criticism, as did the invalid who was told that the stimulants with which he was keeping himself alive were "unhealthy," "Death is more unhealthy still!" *

THE Dakota tin mines have not been much talked about for some months, but they are likely to be heard from soon in a convincing manner. The Etta mill is nearly completed and is expected to begin concentrating about the end of this month. An immense block of the ore, weighing some 9000 pounds, has been brought here on its way to London, where it will undoubtedly create a sensation. We are told that this great block, nearly 6 feet by 3 feet 6 inches outside dimensions, is a part of a block of about three times its size, which was broken out in a single blast in the vein that brought down more than one hundred tons of ore. What the average yield of the ore of the magnificent specimen now here may be it is still impossible to say. Estimates vary from 1½ to 4 per cent; and since the 200-ton mill will soon set the question definitely at rest, it is needless to guess at it. Recent reports from the mine are highly encouraging, and lead to the expectation that before long this country will enter the field as a tin producer on a substantial scale.

WE are indebted to the courtesy of Mr. ALBERT WILLIAMS, Chief of Division of Mining Statistics of the United States Geological Survey, for advance-proofs of Mr. CHARLES KIRCHHOFF, Jr.'s, report upon the copper production in 1885, which we give on another page.

The report bears evidence of Mr. KIRCHHOFF'S usual painstaking industry, and the promptness with which it is given out makes it doubly valuable.

Comparing Mr. KIRCHHOFF'S official returns with the figures of production published in these pages January 30th, and supplemented as to the Atlantic and Allouez official figures, February 13th, and the Clark's Colusa, Montana, supplemented in our last week's issue, to read 10,000,000 instead of 6,000,000 pounds, it will be noticed that our total figures are about 4½ million pounds less than those of Mr. KIRCHHOFF. This difference is apportioned 1,000,000 pounds to Lake Superior, and the remainder is mostly to be credited to the Anaconda.

We mention this because Mr. KIRCHHOFF'S figures do not give the production of the several mines in Arizona and Montana, as our figures did.

With regard to the exports of copper from this country in 1885, Mr. KIRCHHOFF'S figures are higher, and, consequently, his figures for home consumption are lower than are generally accepted by those best informed in the trade. The data on which Mr. KIRCHHOFF bases his estimates are stated, and bear evidence of the usual care which has earned for him the reputation of a model statistician.

THE *American Artisan*, of Chicago, which claims to represent the stove trade, in a personal attack upon Mr. J. C. BAYLES, the editor of its rival, the *Metal Worker*, makes unwarrantable use of our good-natured shot at that gentleman in our report of the Pittsburg meeting of the Institute of Mining Engineers. The fact that Mr. BAYLES, in laying down the law of "Professional Ethics" from the presidential chair, omitted to refer to an earlier paper by a member of the Institute on the same subject, gave us the opportunity to chaff him on an apparent discrepancy between his preaching and his practice. But the *Artisan*, with no other basis than this piece of pleasantry, charges Mr. BAYLES with having read as original the paper formerly presented to the society by another man! This ridiculous distortion of the facts and of our comment scarcely needs contradiction. We did not, and do not, attribute to Mr. BAYLES either the absurd dishonesty of such an imposition, or the offense of plagiarism. The earlier paper was read before Mr. BAYLES became a member of the Institute, and though duly published in the ENGINEERING AND MINING JOURNAL at the time, the official organ of the Institute, it, like many other papers of the first two years of the history of the society, had to be omitted from the Transactions for lack of financial ability to publish on a larger scale.

It goes without saying that Mr. BAYLES should have read all the volumes of this JOURNAL; but his not having done so, though a serious shortcoming, still passes in our catholic charity as something less than a moral delinquency, and it has, like most of our other little transgressions, brought its own punishment—a moral we would impress on all who are not our "constant readers."

Mr. BAYLES'S offense is bad enough; but what are we to think of the esteemed contemporary which, after abusing him in language that sadly needs refining, on the very next page deliberately takes our editorial on "The Fuel of the Future" and credits it to Prof. J. P. LESLEY? Nothing but the compliment implied in attributing our ideas to this

Nestor of science holds us back from "polishing off" this burnisher of stoves and morals in a manner that would make even one of his own stoves burn with envy.

THE CHINESE QUESTION.

Every patriotic American is very naturally and properly both proud and jealous of the deserved reputation Americans as a people have gained for unbounded hospitality, for fairness and integrity in business transactions, and for the frank concession to others of the inalienable right they claim for themselves, the right to "life, liberty, and the pursuit of happiness;" and yet as a nation we are allowing this treasured reputation to be lost through the actions of those our hospitality has covered, and of a few demagogues, who inflame the prejudices of many of our citizens and of the otherwise worthy foreigners among us.

We refer, of course, to the scandalous treatment of the Chinese in the Western States and territories.

The question is not now whether a large influx of Chinese would be desirable; it would, no doubt, present some elements of danger; but we have a certain number of Chinese now here by special invitation, as it were, covered by a solemn treaty in which the good faith of our nation is involved, and we are treating them in a manner that grossly violates the very claims we so proudly make to the consideration of the civilized world, and in a manner that, if applied to our own citizens in China, we should promptly resent with indignation, and by force, if necessary.

It is sometimes said that the Chinese in this country are barbarians, having no morality, but this charge is oftenest made by those whose honesty and morality would not compare at all favorably with those of the average Chinaman. We believe it is unquestionable that he is intelligent, industrious, frugal, and peaceable, and his morality (in every sense) is above that of many of the other foreigners who come to this country, and not a few of whom are now endeavoring to expel this thrifty and docile rival.

Should China retort, as we would if Americans were treated in China as Chinese are here, and expel Americans from China, and transfer her business from this country to our rivals in trade, we should lose the most important and profitable market that is to-day opening up for our manufacturers—an outlet that we greatly need to keep our mills and factories running. We could not with good grace complain should China take such measures as would involve a loss to this country of many millions of dollars yearly. And every principle of honesty and good faith makes it incumbent on our government to promptly pay the losses the unoffending Chinese have suffered through the violence of our citizens, or "the stranger within our gates." The honor of our country, the preservation of our good name, and our respect for the rights of others, are certainly sufficient inducements to every worthy American to discountenance and to prevent, so far as he can, the flagrant outrages against the Chinese that are of frequent occurrence in some of our Western States; but to those who may ignore these moral claims, perhaps the money cost of dishonesty and national dishonor may more than balance the advantages of "keeping in with" the demagogues and hoodlums who are doing so much to demonstrate the superiority of the Mongolian.

THE EAMES "GRAPHITE PROCESS" FOR PRODUCING IRON AND STEEL.

In this JOURNAL of June 6th, 1885, we gave some particulars of Dr. EAMES's experiments then being made at Sing Sing, N. Y., on the direct reduction of iron from its ores. As we then stated, Dr. EAMES employs a small reverberatory furnace in which the iron ore, mixed with from 15 to 20 per cent of impure graphite, is subjected to a heat just sufficient to soften the iron and let it ball—a heat more than is necessary to melt completely the ordinary gangue or impurities that acccompany the iron in the ore, but not high enough to reduce phosphorus or silicon. After heating for 2 or 2½ hours, the iron sponge is balled and pressed in a rotary squeezer, to get rid of the slag. The ball is then cut up for melting in a crucible, or is treated in an open-hearth furnace.

For some months past, extensive experiments have been made with this process at the Fort Pitt Iron and Steel Works of Messrs. GRAFF, BENNETT & CO., of Pittsburg. These experiments covered a great variety of ores, and about 100 tons of iron have been made, some of which has been manufactured into fine steel that is reported to possess very remarkable qualities.

Dr. EAMES informs us that his associates, constituting the Carbon Iron Company, of New York, and Mr. MATHEW GRAFF, of GRAFF, BENNETT & CO., of Pittsburg, have decided to purchase the Fort Pitt Works and at once begin the erection of 20 reverberatory furnaces, costing about $1200 each, and capable of treating a charge of 2 tons in 2 or 2½ hours; or say from 150 to 175 tons a day working capacity for the 20 furnaces. The crucible steel department of these works has two holes with 16 pots each, or a capacity of say 15 tons a day. Contracts, we are informed, have already been booked for a large quantity of the steel, both crucible and open-hearth.

The expenditure of several hundred thousand dollars for the works and furnaces by those who have taken part in the experiments is itself, with the average man, perhaps the strongest testimony as to the practical success of the process; but the data that we give herewith concerning the quality of the ore treated and of the iron produced, though not nearly as complete as we could desire and as we hope at another time to give our readers, is still extremely interesting and important.

The graphite, which forms 15 or 20 per cent of the charge, is mined near Cranston, Rhode Island, and contains from one to sixteen per cent of iron, which of course is recovered in the furnace. The fuel used at Pittsburg is natural gas, admirably adapted to this, as it is to nearly every other metallurgical purpose. The iron ore used was from various mines. Thus, of Old Bed, Champlain, ore there were treated from January 18th to 25th, 1886, 31,730 pounds, which, counted at 68 per cent metallic iron, contained 21,576 pounds of iron. The actual product was 20,911 pounds of billets and sponge iron, or a loss of 3¼ per cent. As, however, the graphite used contained some iron that went into the sponge, and as the actual assay of Old Bed ore may have exceeded 68 per cent, this figure of loss is not reliable.

In reducing 700 pounds of New Bed ore, the loss was 10 per cent, and the loss in converting the billets into steel ingots was 10 per cent, as given by Mr. MATHEW GRAFF, of Pittsburg, under date of January 26th, 1886.

The following are the analyses of some of the ores tested:

	I.	II.	III.	IV.	V.	VI.
Fe	68·800	69·400	69·210	69·000	68·240	68·180
SiO	2·360	·910	2·600	1·150	4·032	1·940
P	·039	·006	·056	·005	·038	1·070

I. Vermilion Lake ore; II., Pilot Knob; III., Republic ore; IV., Lake Angeline ore; V., Lake Champlain New Bed; VI., Lake Champlain Old Bed.

A bar of EAMES'S iron made from Old Bed (Champlain) ore heated and hammered gave Fe, 98·58; P, ·017; S, none; Carbon, ·08; Mn, trace. This shows a remarkable elimination of phosphorus, due, no doubt, to the low temperature at which the reduction of the iron is effected. The following letter, from the well-known iron manufacturer, Mr. T. F. WITHERBEE, of Port Henry, New York, to Mr. ANDREW DICKEY, President of the Carbon Iron Company, of New York, under date of January 8th, 1886, is very interesting:

"The analyses of your samples of sponge and steel made by the graphite process is as follows, as reported to our chemist, Mr. Dawes:

"*Sponge from New Bed Pure Ore.*—Iron separated by a magnet, from 100 parts sponge pounded in a mortar, equals 90·11 per cent. The 90·11 iron gave 0·498 per cent silicon, 0·002 per cent sulphur. The slag residue gave iron, 34·05 per cent; carbon, 1·57 per cent; silica, 32·95 per cent; alumina, 19·65 per cent; lime, 0·75 per cent. The loss in iron is consequently only 3·43 per cent.

"*Analyses of Samples of Steel.*—Vermilion Lake ore: Manganese, 0·077 per cent; silicon, 0·149 per cent; sulphur, 0·00 per cent; phosphorus, 0·03 per cent; carbon, 0·94 per cent. New Bed pure ore: Silicon, 0·223 per cent; phosphorus, 0·03 per cent; carbon, 1·12 per cent."

On the question of the elimination of the phosphorus, Mr. WITHERBEE again writes Mr. DICKEY under date of February 5th, 1886, as follows:

"In regard to the elimination of phosphorus from Old Bed ore, recently accomplished by your carbon process, I would say that, in my opinion, it is owing to the low percentage of silica in the charge and slag. I know of no experiments showing that so much could be volatilized, though Lowthian Bell mentions expelling in two hours in that way 17·6 per cent from a phosphate of iron containing two thirds phosphoric acid, mixed with one half part of silica.

"Gruner was among the first to show that silica tends to break up phosphorus compounds, and that 30 per cent of silica would prevent dephosphorization by iron oxide; 20 per cent of silica is laid down as the highest percentage of silica allowable in the basic Bessemer cinder; and it has always been reported, so far as I have seen, much lower.

"The Old Bed ore is very low in silica and high in bases, lime (mostly a phosphate), alumina, and manganese.

"The problem is not the same as eliminating phosphorus from iron, as it is not chemically united with the iron in the ore, so that any mechanical process would seem all that is required, even heat, to fusion of the earths, provided said heat did not reduce phosphoric acid to phosphorus, and unite with the iron.

"It is noteworthy that sponge made from New Bed ore, which contains some free silica, does not show any great reduction in the amount of phosphorus, though perhaps a trifle, and from the analysis of its slag (32 per cent silica), I should not expect it to be in it, so that if any is eliminated from New Bed ore, it must be by volitilization.

"It may be urged that the hot metallic iron would also break up the lime phosphate and appropriate to itself the phosphorus; but I think that is not so when a proper basic slag is present, as, for instance, the Siemens direct process, when the iron is in a pasty, hot condition; the phosphorus is held in the slag by iron oxide.

"It has been a question among metallurgists just what the office of lime is in the basic Bessemer process; that is, whether it holds the phosphorus itself, or whether it merely overpowers the silica and enables the iron oxide to hold it.

"An analysis of the Old Bed metal slag (which I hope soon to see) * would throw much light on this very interesting and important subject.

"So far as I can see, now that 'the deed is done,' the favorable conditions are—1st, an ore with a basic gangue low in silica, with the phosphorus in chemical combination with it (the gangue), and not with the iron oxide; 2d, a process that reduces the iron oxide, and does not reduce the phosphoric acid.

"The first condition is certainly filled by the Old Bed ore, and the second seems to be by your carbon process.

"The results shown are so startling that I offer the above 'subject to revision.'"

As Mr. WITHERBEE says, these results are "startling," and will unquestionably attract the attention of metallurgists; but no less startling are the reports of tests on the quality of the steel produced in the crucible from Eames's sponge. Whether the remarkable quality of the steel is to

*The following is Mr. H. F. Dawes's analysis, referred to by Mr. Witherbee:

"Copy of analysis made February 20th, 1886, by H. F. Dawes, chemist, Port Henry Steel and Iron Company, Limited, Port Henry, New York. 'Steel made by carbon process under Eames's patents, from Old Bed ore, which contains 1·06 phosphorus: Analysis of ingot: Carbon, ·26; manganese, none; phosphorus, ·57; silicon, ·018; sulphur, ·002.'"

be attributed to the greater purity of the iron due to the low temperature at which it is reduced, or to some other cause, the fact appears to be established that the quality is superior to that of steel produced in the ordinary way.

It now remains to be seen whether the high quality can be maintained uniform, and the intention of the Carbon Iron Company and Mr. MATHEW GRAFF to begin the manufacture of sponge iron and open-hearth and crucible steel on the scale of 150 tons a day, is convincing evidence of the satisfactory result of the experimental work thus far performed. The great simplicity of the process is to the practical metallurgist one of its most attractive features. There is no rabbling in the furnace; the ore and graphite are charged, and after heating for about two hours, the sponge iron is simply rolled into balls, which are then passed through the squeezer and are ready to go to the open-hearth or crucible furnace to be made into steel. Practically, nearly all the iron charged in the ore is obtained in the billet.

The low temperature at which the entire operation is carried on, and the absence of rabbling, greatly prolong the life of a furnace.

The process requires no skilled labor, and involves no such heavy work as puddling.

The Cost of Production.—This, and the quality of the product, are certainly the most important questions in the problem.

We have already spoken of the remarkably fine quality of the steel produced.

Mr. EAMES and Mr. MATHEW GRAFF give the following figures as a full and safe estimate of the cost per ton of crucible steel as made recently at the Fort Pitt Iron and Steel Company's works in Pittsburg:

Two tons ore, at $6	$12.00
Half ton graphite, at $4	2.00
Labor, repairs, etc	5.00
Fuel (natural gas)	1.00
	$20.00
Melting	4.50
Crucibles	8.50
Labor and repairs	4.00
Fuel (natural gas)	.50
	$37.50
Cogging and finishing	13.00
Labor and repairs	1.50
Fuel (gas)	1.00
Incidentals	2.00
Total cost of crucible steel, per ton	$55.00

Some at least of the above items appear to allow room for a very heavy reduction; and, assuming the quality of the product to be uniform, the total cost in working on the large scale above mentioned might be less than the figures here given, even including interest on investment. These figures are scarcely less "startling" than the elimination of the phosphorus from Old Bed ore by this process.

CORRESPONDENCE.

[We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
All letters should be addressed to the MANAGING EDITOR.
We do not hold ourselves responsible for the opinions expressed by correspondents.]

Examples of Remarkably Good Tunneling Work.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your issue of February 6th, I noticed an account of the "remarkable" work done at shaft No. 17 of the New Croton Aqueduct; and in your issue of February 27th, the comparisons made by "J. C." Allow me to add my mite. During the month of February, consisting of twenty-four working days of two ten-hour shifts each, two men to the shift, there have been driven at the Richmond lead mine, with one of Rand's Little Giant No. 2 drills, nine drifts seven feet high, four feet wide, and one hundred and thirty-two feet long, through hard magnesian limestone interspersed with layers of flint. These men have had to do their own blasting, throwing back the *débris* and laying the waterways. Now, this amount of work for four men with one drill to accomplish in that space of time is in my opinion "wonderful." "Let honor be given to whom honor is due." Yours respectfully,

SHULLSBURG, WIS., March 8. F. C. RICHMOND, Superintendent.

The Recent Decision on Adams's Nickel-Plating Patent.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: It may appear somewhat presumptuous on my part to attempt to call in question the soundness of Judge Sawyer's decision in the case of the United Nickel Company *vs.* the Californian Electric Company; but with your permission, I will endeavor to show that his decision not only gives Mr. Adams protection for his process, but it virtually gives him the sole and exclusive right to the art of nickel-plating by means of the double sulphate of nickel and ammonia and the double chloride of nickel and ammonium—no matter how such salts may be prepared for commercial use. Now, I submit that the learned judge, in allowing the first claim of Adams's patent to stand, bars all persons from practicing the art of nickel-plating with *pure* solutions of these salts—no matter how prepared. He has gone farther than to merely give protection to the patentee's own method of preparing such solutions; he has given him the right to that which has been the common property of platers ever since the birth of the art of electro-deposition, namely, that of preparing their solutions from *pure* materials. To demonstrate this, let us see what Adams's first claim signifies. It runs as follows:

'The electro-deposition of nickel by means of a solution of the double sulphate of nickel and ammonia, or the double chloride of nickel and ammonium, prepared and used in such a manner as to be free from the presence of potash, soda, alumina, lime, or nitric acid." Judge Sawyer says, "This is what the first claim is. It is plating by means of the described solution, and the condition under which plating can be done is, that the double sulphate of nickel and ammonia, or the double chloride of nickel and ammonium, must be prepared in such a manner as to be free from the presence of potash, soda, alumina, lime, or nitric acid, or from any acid or alkaline reaction. These are essential conditions, which Adams discovered, and it does not appear that Dr. Boettger ever discovered that these were necessary conditions. It does not appear that he ever discovered that the absence of all these elements is essential to successful nickel-plating for commercial purposes." Now I think it may be taken for granted that neither Dr. Boettger nor Alfred Smee would have experimented with crude nickel when preparing solutions for electro-depositing this metal. It is far more natural to conclude that they would have exerted the same prudence that is common to all persons practicing electro-deposition, and have taken care to obtain pure metal when preparing their electrolytic baths. It would scarcely have occurred to either of the scientists named to impress upon intending nickel-platers the necessity to exclude from their nickel baths substances that could never get into them except by using crude metal.

"In preparing this solution," Adams says in his specification, "the inventor prefers to use pure nickel, but commercial nickel may be used." Now it is clear from this statement that Adams recognized the existence of *pure* nickel, and preferred to use it; and we may accept it as a fact that, when making up solutions from the pure metal, the ordinary manipulations described in his specification for treating nickel would be unnecessary, since the substances named in his first claim would not be present, and would not, therefore, need to be eliminated. "Commercial nickel," Adams observes, "almost always contains more or less of the reagents employed in the purification or manufacture of the metal, such as sulphate of lime, sulphide of calcium, sulphide of sodium or potassium, chloride of sodium and alumina. *When* any of these substances are present, it is necessary to remove them." We may take it that, when they are not present, the "conditions" referred to in the first claim have been fulfilled by the manufacturer or refiner of the "commercial" nickel, and that in such case practical solutions might be prepared, even from the ordinary nickel of commerce, without having recourse to the pure metal.

Now, assuming that all sensible persons would "prefer" to prepare their nickel solutions from pure metal—in which case, the substances named in Adams's first claim would not be present—is it not astounding that Judge Sawyer should hold that all nickel solutions that are free from substances that can not be present when pure metal is employed are barred from public use because Mr. Adams has chosen to specify them in his first claim? Had he claimed that the absence of brimstone and treacle from such solutions constituted a part of his claim, it would have scarcely been more absurd. It reminds one of the query in a well-known farce: "Have you a strawberry mark on your left arm?" "No." "Then you must be my long-lost brother!"

To return to the "conditions" mentioned in Adams's first claim, and upon which the learned judge laid such great stress in his summing up: Two of the substances, potash and soda, could not exist, as such, in solutions of the double sulphate of nickel and ammonium or the double chloride; and it is equally difficult to understand how lime could be present in such solutions. If, therefore, the absence of these substances is a necessary result of chemical incompatibility, how can such absence be claimed as a "discovery"? Again, assuming that pure (or commercial) nickel is dissolved with the partial assistance of nitric acid, and that the acid solution thus obtained is properly neutralized with ammonia, before the addition of sulphate of ammonia to form the double salt, how is it possible to conceive that this acid could be present in a solution prepared from the compound crystals? Would not the absence of this acid be a mere matter of fact? And if so, how can it be held in law that the non-existence of this acid in nickel solutions may, if a patentee pleases, give him the right to claim such solution as his own?

After referring to the arguments of the defendants' counsel, in the suit referred to, in which it was shown that the nickel of commerce was sufficiently pure for the preparation of nickel solutions, without having recourse to Adams's process for preparing them, the learned judge observes: "But consider that to be so, still all the conditions in the aggregate appear to be the same. If that be so, it only shows that commerce demands an article of nickel free from some of the deleterious elements, and which is in a proper condition to be used in solution, without otherwise previously eliminating them. Hence these preparations at this day for commerce. But, even on that hypothesis, Dr. Adams still discovered the conditions necessary to successful nickel-plating, and the demands of commerce are, that the articles should be in such a state as to conform to the conditions necessary to use in that art; that is to say, the nickel must be made in some way to conform to the conditions, when in solution, which he describes as necessary, in order to make nickel-plating a success in the practical arts of life." Again I say that the "conditions" referred to in Adams's first claim are an unnecessary introduction in a specification, if *pure* nickel, which "the inventor prefers to use," be employed in making up nickel solutions, and which material alone would be selected by all persons having a proper knowledge of electro-deposition.

The "demands of commerce," therefore, Judge Sawyer further observes, "on that hypothesis are such that the necessary conditions must exist either in the preparation of the solution or in the prior preparation of the nickel used which enters into the solution, *but the use of the conditions* of nickel-plating is nevertheless a violation of the patent, because the nickel is put in a condition by which it can be introduced into the solution with less trouble and expense." The "conditions," we are told, must exist either in the preparation of the solutions or in the "prior preparation of the nickel." We may assume from this that, if the conditions are fulfilled in the latter case, there would be no need to resort to the patentee's specified method of preparing the former, and this is precisely the position taken up by the nickel-platers in this country, who proved to the satisfaction of the late Master of the Rolls, Sir George Jessel—one one of the most astute judges that ever sat in a court of justice—and whose judgment was subsequently sustained in

the House of Lords, in the case of the Plating Company (the owners of Adams's patent) against Farquharson and others. In the several trials that took place in support of Adams's patent, it was shown that, in pursuing the art of nickel-plating, the defendants had not infringed Adams's process; that their solutions were prepared from nickel salts manufactured according to the directions given in Brande's *Manual of Chemistry*, Vol. I., page 812, published in the year 1848, and which preparations, Brande observes, Boettger recommends as being the "best salt for the deposition of nickel upon brass or copper in electro-plating."

Respecting the improved condition of commercial nickel, Judge Sawyer further observes: "All this preparation is made subsequent to the discovery of the conditions on which practical nickel-plating can be successfully carried on, and therefore can not avail to avoid a violation of the patent." Once more, I say that the so-called conditions are naturally fulfilled when pure nickel—which the inventor "prefers to use"—is employed, and that therefore he can not claim them as his own. In making up gold and silver baths, the plater takes care to employ fine gold and silver, well knowing that upon the purity of these metals depends the success of his gilding and plating operations. His instructors (the various writers on electro-deposition) direct the use of pure metals for making up the respective solutions and maintain that it is always understood that pure metals only should be employed for the purposes of electro-deposition. For a patentee to lay claim to the sole right to use solutions that are free from substances that can not, unless purposely introduced, exist in them, is about as preposterous a notion as it is possible to conceive; and it strikes one with amazement to find that upon such a basis the monopoly of the whole nickel-plating industry of a great country like America should be placed in the hands of one man by any living judge.

In conclusion, it may be well to quote the method of preparing the salts of nickel given in Brande's *Manual*, by which it will be seen that perfectly pure salts are obtainable, by simple means, in all respects fulfilling the "conditions" about which such a fuss has been made in the patentee's endeavor to transform an old and published process into a new "discovery." Brande thus tells us how to prepare the single sulphate of nickel: "Sulphate of nickel is formed by dissolving the oxide or carbonate of nickel in diluted sulphuric acid. . . . The salt is sometimes obtained by heating commercial nickel in sulphuric acid, with occasional addition of nitric acid, but is impure." Here we have a direct line drawn between the pure and the impure product. Having thus described how to obtain a pure sulphate of nickel, Brande thus directs us how to form the double salt: "Sulphate of ammonia and nickel is obtained by evaporating a mixed solution of sulphate of ammonia and sulphate of nickel; it forms four-sided prismatic crystals (sp. gr. 1·8) of a blue-green color, soluble in 4 parts of cold water, and consisting, according to Mitscherlich, of 1 atom of sulphate of ammonia, 1 of sulphate of nickel, and 8 of water." Thus, we see that, by simply adding to a solution of pure sulphate of nickel, prepared in a most simple fashion, an equivalent proportion of sulphate of ammonia in solution, we obtain, after evaporation, the pure double salt; and it is impossible to think that Mr. Adams was ignorant of the existence of Brande's work when he turned his attention to nickel as the subject for a patent. Whether this was so or not, the *prior publication* of the method of forming the double salts, and the reproduction of Boettger's recommendation to employ them in nickel-plating, would render any subsequent patent claiming the employment of pure nickel salts worth less than the price of the paper on which it happened to be printed.

ALEXANDER WATT.

LONDON, Feb. 5, 1886

OFFICIAL STATEMENTS AND REPORTS.

The Quincy Mining Company, Mich.

From the directors' report of the business of the mine for the past year, we make the following extracts:

The shipment of the season was 7,091,765 pounds of mineral, which has been smelted at Detroit, and yielded about $82\frac{47}{100}$ per cent, or 5,848,497 pounds of refined copper.

The product of the mine, as prepared for shipment, was 7,091,805 pounds, or $3{,}545\frac{1805}{2000}$ tons of mineral, of the following description, namely:

	Pounds.
Stamp copper	6,604,125
Mass copper	487,680
	7,091,805
For which, estimating the product left over at the mine at 82 per cent yield, and all copper on hand, unsold, at 11½ cents per pound, has been realized the gross sum of	$665,575.19
Realized from sale of silver	2,941.25
	$668,516.44

The expenses of the year are as follows:

Running expenses at mine		$323,414.26
Building and construction account		17,829.67
Smelting, transportation and all other expenses		97,377.06
		$438,620.99
Which, deducted from gross earnings		668,516.44
Leaves as mining profit		$229,895.45
There has also been realized during the year, from interest on loans		3,258.28
From real estate, "Hancock"		2,500.00
		$235,653.73
The statement of assets and liabilities in our last report showed a balance on hand, as of date, January 1st, 1885		$517,346.68
Add earnings of 1885		235,653.73
		$753,000.41
Deduct dividend of February 16th, 1885	$100,000.00	
Deduct dividend of August 17th, 1885	80,000.00	180,000.00
Leaving balance of assets, January 1st, 1886		$573,000.41

A dividend of $4 a share, or $160,000, payable February 15th, has been declared, which, with dividend of $2 a share, paid August 17th last, makes total from the year's business $240,000.

GENERAL SUMMARY OF RECEIPTS AND EXPENDITURES OF THE QUINCY MINING COMPANY, FROM ITS ORGANIZATION TO DECEMBER 31ST, 1885.

Expenditures.

For Expenditure on location previous to 1856	$42,097.98
Expenditure on Quincy vein, 1858, not now worked	55,000.00
Openings and explorations on 3800 feet "east" or Pewabic vein, extending to Portage Lake, preparatory to future work	11,500.00
Real estate and permanent improvements on same, including dwelling-houses, stamp-mill, machinery, steam-engines, tram-road, dock, warehouse, and other buildings and roads	914,946.19
Mining and surface labor, expenses of smelting and marketing copper, and all incidental expenses	11,555,212.87
Balance carried down	4,743,000.41
	$17,321,757.45

Receipts.

From capital stock paid in	$200,000.00
Proceeds, copper and silver (82,320,408 pounds copper)	16,878,489.79
Interest	106,740.07
Profit on sale P. L. & R. Improvement Company stock, and other investments	79,637.16
Sale of real estate, Hancock, Michigan	56,890.43
	$17,321,757.45
By balance brought down, being receipts over expenditures	4,743,000.41
Deducting dividends declared, Nos. 1 to 34 inclusive	4,170,000.00
Leaving balance as per statement in detail	$573,000.41

The following is a summary of the agent's report for the year:

Average force employed	400 men.
Number of miners	132 "
Wages of miners on contract, per month	$44.00
Yield of Mineral per fathom of ground broken	865 pounds.
Refined copper per fathom of ground broken	710 "
Total rock Mined	147,626 tons.
Hoisted	111,402 "
Stamp rock treated	108,181 "
Yield of rock stamped 3·05 per cent	6,604,125 pounds.
Product mineral	7,091,805 "
Refined copper	5,848,530 "

The agent, Mr. S. B. Harris, states that the general appearance of the mine is encouraging and good results may reasonably be expected from the current year's work.

Ridge Copper Company, Mich.

The report for 1885 shows a product of 79,137 pounds of mineral as the result of tribute work. This cost the company 5 cents a pound to purchase, and yielded almost 80 per cent of ingot. The mine was idle during the summer, but tribute work was resumed November 1st, and 20 miners are now engaged, nearly all in the upper levels. Other laborers are at work preparing more ground for tributers. While the present rate of copper rules, it is advised that tribute work be continued.

When the present depression in business has passed, and the price of copper advances, steps should be taken to place the mine in a better condition to work. A more modern equipment, so as to work on a larger and cheaper scale, is needed. The manager strongly advises that the old mine, abandoned in 1859, be unwatered. It has been sunk to the 40-fathom level on the Butler or Champion vein, which has always been very productive in copper wherever worked. At the time it was worked, they only looked after the mass copper. There must be a large amount of standing ground that would pay to work, besides a large amount of rich stamp rock accumulated in the mine. This mine lies to the north, about 800 feet from our present mine, and could be reached and worked from our present mine by a cross-cut driven through to it. Other veins would also be cut by this cross-cut, most notably the Knowlton vein, which has proved a very rich one at the Knowlton, Mass, and Belt mines. To do this, power drills would be required to do the work speedily and cheaply. The old mine, however, could soon be unwatered, and without any very great cost, and could be made profitable. The present mine is a mere "hole in the ground," actual mining work having been confined principally to the first, second, third, and fourth levels; only one shaft has been sunk to the seventh level, and but little drifting has been done below the fourth level. The water is up to the fifth level; there is no use unwatering below that, unless the company should decide to extend the lower levels. Either of these courses would necessitate the levying of an assessment of 50 cents or $1 a share.

The financial exhibit of the company is as follows:

The product of the mine for the year has been—		
Barrel copper, pounds		60,134
Mass copper, pounds		19,003
Total, pounds		79,137
Which has realized		$7,217.70
Received from interest		76.53
Total receipts		$7,294 23
The expenditures of the year have been—		
Mine expenses	$4,972.88	
Other expenses, as per treasurer's account	3,487.15	—8,460.03
From which deduct total receipts		7,294.23
Loss on business of the year		$1,165.80
The statement of assets and liabilities in last report showed a balance of		$8,584.85
Deduct loss on business of 1885		1,165.80
Balance on January 1st, 1886, as per statement		$7,419.05

The balance-sheet shows these items of general interest:

Cost of property	$203,541.00
Expenditures to January 1st, 1886	1,123,573 81
Dividends paid	99,784.50
Capital stock paid in	410,000.00
Sales of copper to January 1st, 1886	1,007,186.37

LEAD SLAGS.*

By Malvern W. Iles, Ph.D.

(*Concluded from page* 170.)

Analytical Data.—In the table of slag analyses, the date indicates when the analysis was performed; in most cases, the time of production and the date of analysis do not widely differ. The numbers simply serve to distinguish one kind of slag from another.

The fire-assays were in every case carefully determined. The specific gravity determinations were in almost every case found by use of the Jolly spring balance. Some of the earlier determinations of silica are a trifle too high, but by far the largest number of tests were the result of careful fusion. Lately, it has been found that accurate silica determinations could be obtained by taking the slag samples in a manner previously mentioned. The iron was determined by the use of a standard solution of potassium permanganate, with except perhaps those given by Mr. R. C. Ballard. The lime tests were made partly by gravimetric and partly by volumetric tests. Some of the manganese tests are by the well-known bromide method, and weighed either as a phosphate or an oxide of manganese; all of the more recent determinations were made by using the excellent zinc oxide method, the details of which have been fully given under the heading of chemical analysis. The alumina, magnesia, and lead determinations were made by use of the good old-fashioned methods. The sulphur test was performed by fusion with caustic potash as above indicated.

In the table of analyses, there may be found every kind or type of slag produced in connection with the lead-silver smelting industry I have been able to find up to the time of writing (July, 1884). In several cases, certain types have been repeated to show how the lead and silver losses vary under different circumstances, as, for example, when producing high or low grade bullion. The extreme limits of lead slags may be stated as follows:

	Per cent.
SiO_2	26 to 41
Fe + Mn	18 to 35
CaO	5 to 35

It is exceedingly rare that the extremes will work satisfactorily for long campaigns; yet often to accomplish certain results, as, for example, freeing the crucible of the furnace from obstructions or crusts, one can very materially prolong the life or campaign of the furnace by the use of certain extreme slags. By very careful observation based upon analytical data, the metallurgist can determine whether the trouble arising from the crucible be due to a siliceous accumulation, an iron crust, or a charcoal, coke, zinc, or lead crust; by acting upon any of these crusts at the right time and for a sufficiently long time with certain slags, we can generally eliminate these troubles.

Most of the best slags will have a composition ranging somewhere within these limits:

	Per cent.
SiO_2	31 to 36
Fe + Mn	23 to 30
CaO	14 to 25

And to still further restrict the limits, we may say that the best work is done, the campaigns are longest, and in the short the most economical slag produced, when its composition lies within these very narrow limits:

	Per cent.
SiO_2	31 to 34
Fe + Mn	24 to 27
CaO	14 to 25

In some very exceptional cases, and on certain ores, it may be best to have a slag containing less than 31 per cent or more than 34 per cent silica; and the same may be said in regard to the iron, manganese, and lime bases. The prices paid for iron and iron fluxes, taken in connection with the impurities to be contended with, should, in short, determine the type of slag to be produced. To decide exactly what is the best slag for the treatment of ores where zinc, alumina, magnesia, baryta, and arsenic enter either singly, or all together, in large quantities, is necessarily a very intricate and difficult problem. For the reasons just cited, no one slag can be said to be the best under all circumstances. A careful investigation of the analytical data as given in the table will, I think, present some very interesting features, and at the same time disclose some hitherto unrecorded facts.

Types.—By the term "slag types" are meant those slags that are built up according to some well-defined composition, and which always have a distinct crystalline form. Many of these types approach in composition certain well-known siliceous minerals. It is somewhat rare to find in the same piece or pot of slag more than a single kind or type, though such cases will occur occasionally when there is a marked change in the ore charge, or where there is fed into the furnace a slag different in composition from that produced by the ore and lime flux. I have studied slags, with no small amount of care and attention, through the following wide ranges of composition:

	Per cent.		Per cent.
SiO_2	26 to 41	Mn	Trace to 40
Fe	18 to 45	MgO	Trace to 8
CaO	5 to 35		

While it is possible, and even probable, that there may be some particular kind or class of slags that has escaped observation, the following types will include practically every known slag that is well adapted for argentiferous lead smelting:

Types of Lead Slags.

TYPE.	Percentage.		
	CaO.	FeO + MnO.	SiO_2.
A	6	52	32
B	10	45	35
C	12	50	28
D	16	34	34
E	20	40	30
F	24	33	33
G	28	27	35

* From *Mineral Resources of the United States* for 1884.

It must not be understood that these types are rigidly fixed, since all of them are subject to certain ranges or limits, and still may be quite fair slags. Some, it has been noticed, are subject to wider limits than others; this is particularly true of the type F. By observation and long experience, it has been found that slags of a certain kind are easily fusible, run freely, prevent certain mechanical difficulties in the crucible, and admit of long campaigns. These slags occasion small silver and lead losses, and are therefore to be imitated as nearly as practicable; but to say that a certain slag is good or bad if the type is not accurately obtained is certainly erroneous. Where the type is so clearly approached that there occur certain slight alterations in the crystalline form, the slag may be, and generally is, a very good one to make: now, to alter the slag so that the type may be more closely approached, will sometimes be highly impolitic from a commercial stand-point. If, in short, we alter a slag that already closely approaches a given type, the cost should be an important item in the consideration, and not the beauty of the crystals.

I have noticed that most slags produced *between* certain recognized types assume a distinct appearance that more or less resembles that of the minerals pectolite and wavellite. Slags having a structure closely resembling these minerals may be designated as pectolitic or wavellitic slags. From what has been said, it will be seen that all pectolitic and wavellitic slags may be regarded as abnormal. Generally, pectolitic and wavellitic slags run high, that is to say, carry too much lead and silver, especially the latter, yet a very few exceptions to this statement have been noted where manganese enters largely into the composition.

There are a few well-defined crystalline slags that are not adapted to lead smelting; this is particularly the case where the percentage of iron is very high and that of lime is low (see type A, Fig. 1 *a*, and analyses Nos. 1, 2, 3, 4, and 6).

All of the above-named various types have been made by the writer, and run for some time, except the type A, which it is thought should only be used under exceedingly peculiar circumstances. It must certainly occasion much loss in both lead and silver, and aside from its being an expensive slag where siliceous ores are treated, it is also a dangerous slag to use, owing to the liability of forming "iron sows." It is thought best never to allow the percentage of lime to drop below 10 per cent.

Type B will keep the furnace in good conditon and the tonnage large, but the silver and lead losses are also liable to be large. This character of slag is illustrated by analyses 12 and 17 and Fig. 1 *a'*. The crystals are generally small rhombic plates, more or less thickened, and are often hopper-shaped, and are characterized by well-defined striations. There are conditions that make this an exceedingly economical slag. Where good limestone is not readily obtained at reasonable rates, this is not a bad slag to make.

Type C, according to Dr. O. H. Hahn, has the formula: $6FeO3SiO_2 + 2CaOSiO_2$; hence the following percentage of composition:

	Per cent
SiO_2	30·61
FeO	55·10
CaO	14·29
	100·00

Now, by deducting 10 per cent as an allowance for the other ingredients, there remain—

	Per cent.
SiO_2	27·55
FeO	49·59
CaO	12·86
	90·00

We therefore see that the slag belongs to the type C. This slag has been accurately described by Dr. O. H. Hahn, in the *Mineral Resources of the United States* for 1882. The salient features may be briefly stated as follows: "The proportion of calcic oxide is to the ferrous oxide as 1 : 4;" it has a marked physical appearance, a distinct crystalline form, color black, "frequently with a rusty-brown film, and a fibrous texture;" it is a good slag, both commercially and metallurgically. It is not as free from lead as type E, "and is especially adapted for smelting ores containing a large percentage of zinc." It will be readily seen that, where exceedingly siliceous ores are treated, which also contain much zinc, type C can not be regarded as an economical slag; while in localities where iron flux is abundant and the ores carry much zinc, this slag can not be too highly recommended.

Type D is well adapted to the treatment of siliceous and very impure ores; it crystallizes in the form shown in Fig. 1 *b*, and corresponds to the formula: $5FeO4SiO_2 + 3CaO2SiO_2$. This gives as its percentage of composition:

	Per cent.
SiO_2	40·54
FeO	40·54
CaO	18·92
	100·00

It was found that by smelting a certain class of ores, the united percentages of Si_2O, FeO, and CaO, as shown by analysis, would be 84; therefore, if we deduct 16 per cent from each of the above given percentages, there would result—

	Per cent
SiO_2	34·06
FeO	34·06
CaO	15 90
	84·02

or practically—

	Per cent.
SiO_2	34·00
FeO	34·00
CaO	16.00
	84·00

It can not be said that the type D is the same as type F, which it closely resembles in chemical composition, since the crystalline form (Fig. 2) and physical properties are entirely dissimilar. Very excellent results have been obtained with this slag, even when producing high-grade silver bullion. The crystals of this slag are more or less translucent, flattened, and often contain an abrupt arrow-shaped point or termination. These crystals should not for a moment be confounded with the sharp, blunt,

ANALYSES OF ARGENTIFEROUS LEAD SLAGS.

DATE.	Number.	Fire-assay. Ounces Ag.	Fire-assay. Per cent Pb.	Specific gravity.	SiO_2.	FeO.	Fe_2O_3.	= Fe.	CaO.	MnO.	Al_2O_3.	MgO.	PbO.	ZnO.	PbS.	S.	Total.	Analyst and remarks.
April 27, 1880	1	2·00	3·00	.....	28 10	43·92	4·33	.....	5·60	5·58	1·85	3·54	5·23	.....	.....	·98	99·13	M. W. Iles.
April 20, 1880	2	2·00	5·75	3·85	26 45	37·11	7.88	.....	8·38	5·20	4·29	3·23	6·19	.....	.....	·55	99·28	Do.
April 24, 1880	3	3 00	4·50	3·80	28·50	42·21	9.48	.....	4·50	5·21	·62	3·06	6·51	.....	.....	·82	100·91	Do.
May 5, 1880	4	2·10	1·50	.....	29·15	38·79	6·37	.....	6·97	6·97	1·31	4·25	5·88	.....	.....	·97	100·66	Do.
June 7, 1880	5	2·50	3 00	.....	37·60	41·54	.....	.....	.....	5·02	4·45	.....	.....	.....	.....	.....	.....	Do.
July, 1880	6	2·50	3 15	3·62	31·50	30·40	12·23	.....	6·00	4·65	4·40	2·99	5·46	.....	.....	1·30	98 93	Do.
January 15, 1880	7	1·00	1·25	3·57	30·20	36·19	.....	.....	22·80	3·81	4·29	0·14	2·36	.....	.....	·62	100·41	Do.
	8	.....	.....	.....	29·27	45·17	.....	.....	8·03	3·91	4 56	4·60	.....	.....	3 91	.....	99·45	R. C. Ballard.
	9	.....	.....	.....	31·32	39·16	.....	.....	8 52	7·96	5·79	7·79	.....	.....	2·50	.....	103·04	Do.
	10	.....	.....	.....	34·12	37 65	.....	.....	7·54	4·11	6·23	.....	4·45	.....	.....	.....	.....	Do.
October 7, 1880	11	Trace.	1 00	.....	33·50	49·88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	M. W. Iles.
January 17, 1881	12	1·00	1·50	3·56	39·10	39·09	.....	(30.40)	8·30	5·02	a·85	3·80	2·65	.....	.....	1·19	100 00	Do.
July 12, 1881	13	·50	·90	3·45	33·40	34·71	.....	(26.99)	25·10	2 00	2·44	Trace.	1·57	.....	.....	·71	99 93	Samuel James.
	14	.....	.....	.....	31·70	35 62	.....	(27.70)	26·50	2 58	2·10	do.	Trace.	.....	.....	·88	99 38	Do.
	15	.....	.....	.....	31·20	40·35	.....	(31.38)	19 90	2·35	2·78	.....	3·79	.....	.....	·55	100·92	Do.
July 16, 1881	16	1·75	3·50	.....	36·40	38·31	.....	(29.80)	10·00	.....	.....	.....	.....	.....	.....	.....	.....	M. W. Iles.
July 27, 1881	17	1·75	2 25	.....	35·80	41·65	.....	(32·40)	12·40	3·35	2·13	Trace.	3·24	.....	.....	·86	99·43	Do.
July 30, 1881	18	1·25	2·00	.....	40·20	33·43	.....	(26·00)	16·60	3·54	2·86	do	3·12	.....	.....	·50	100 25	Do.
July 29, 1881	19	1·46	2·16	.....	36·00	41·14	.....	(32·00)	13·20	3·54	a2·04	.....	3·23	.....	.....	·85	100·00	Do.
February 28, 1882	20	.....	.....	.....	37·96	37·14	.....	(30·00)	12·84	4·24	4·33	Trace.	3·25	.....	.....	·90	100 66	Do.
May 7, 1882	21	Trace.	1·75	3·50	35·40	38·18	.....	29 70	13·50	2·75	.....	.....	.....	.....	.....	.....	.....	W. T. Page.
March 29, 1882	22	1·75	2 50	.....	34·10	45·00	.....	35·00	.....	.....	.....	.....	.....	.....	.....	1·52	.....	W. R. Boggs.
1879	23	1·79	1·60	3·48	34·79	37·69	.....	29·32	13·68	3·87	.....	.....	.....	.....	.....	.....	.....	W. R. Boggs. Average of 15 samples.
	24	1·75	1·25	.....	33·00	49·60	.....	38·60	10·80	.....	.....	.....	.....	.....	.....	.....	.....	W. R. Boggs.
	25	5·00	6·50	.....	29·00	43·00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Do.
	26	7·00	8·50	.....	34·60	44·20	.....	34·40	5·80	.....	.....	.....	.....	.....	.....	.....	.....	Do.
1880	27	12·00	1·75	3·75	25·80	43·80	.....	.....	10·10	.....	.....	.....	.....	.....	.....	.....	.....	Do.
August 30, 1882	28	1·50	3·00	3·65	33·80	47·30	.....	.....	12·80	1·60	.....	.....	.....	.....	.....	1·84	.....	Do.
September 1, 1882	29	Trace.	1 00	.....	31 80	33·70	.....	.....	25·20	1·10	.....	Trace.	1·60	.....	.....	1·62	.....	Do.
March 21, 1883	30	90	1·80	3 60	33·50	37 90	.....	.....	17·05	.....	.....	.....	.....	.....	.....	.....	.....	W. T. Page.
	31	3·80	2·10	3·47	33·25	31·90	.....	.....	19·40	.....	.....	.....	.....	.....	.....	.....	.....	Do.
1883	32	·75	1·25	.....	35·95	24·40	.....	.....	25·05	4·75	.....	Trace.	.....	·30	.....	2·67	.....	Do.
March 21, 1883	33	5·10	3·10	3·78	32·00	42·70	.....	.....	14·20	.....	.....	.....	.....	.....	.....	.....	.....	Do.
May 23, 1883	34	25	1·30	3·75	30·00	43·20	.....	.....	13·30	4·55	.....	.....	.....	.....	.....	.....	.....	Do.
June 14, 1883	35	3·10	10.00	.....	28 00	30·94	.....	.....	16·20	.....	.....	.....	.....	.....	.....	.....	.....	W. T. Page. Charge incorrectly calculated. Mn. very large; not determined.
June 20, 1883	36	·90	2·00	.....	35·40	20·36	.....	.....	14·80	14 83	.....	.....	.....	.....	.....	.....	.....	W. T. Page.
	37	1·25	1·25	.....	34·00	23·04	.....	.....	14·80	12·70	.....	.....	.....	.....	.....	.....	.....	Do.
Jan., Feb., 1884	38	·95	1·41	.....	36·76	34·45	.....	.....	16·61	5·38	.....	.....	.....	.....	.....	.....	.....	W. T. Page. Average of 8 analyses; two months' run.
1879	39	3·00	3·00	.....	31·00	41·52	.....	.....	15·00	1·93	.....	.....	.....	.....	.....	.....	.....	W. T. Page. Abandoned dump.
	40	3·00	3·70	.....	38·40	40·62	.....	.....	7·00	7·48	.....	.....	.....	.....	.....	.....	.....	W. T. Page. Abandoned dump.
February 24, 1884	41	1·00	1·50	.....	3 ·50	36·90	.....	.....	19·00	3·87	.....	.....	.....	.....	.....	.....	.....	W. T. Page.
December 27, 1882	42	1·00	1·75	.....	37·40	35·22	.....	.....	14·90	.....	.....	.....	.....	.....	.....	.....	.....	Do.
February 1, 1883	43	Trace	1·50	.....	38·40	33·90	.....	.....	13·20	.....	.....	.....	.....	.....	.....	.....	.....	Do.
March 14, 1883	44	1 25	1·25	.....	31·50	28·00	.....	.....	18·90	.....	.....	.....	.....	.....	.....	.....	.....	Do.
May 2, 1883	45	1·00	·50	.....	31·50	27·50	.....	.....	20·10	.....	.....	.....	.....	.....	.....	.....	.....	Do.
May 3, 1883	46	·50	·50	.....	32·75	26·50	.....	.....	20·30	.....	.....	.....	.....	.....	.....	.....	.....	Do.
January 18, 1883	47	Trace.	·40	.....	35·00	36·00	.....	.....	14·00	.....	.....	.....	.....	.....	.....	.....	.....	Do.
February, 23, 1884	48	1·25	·50	.....	31·75	31·37	.....	.....	16·40	.....	.....	.....	.....	4·53	.....	.....	.....	Do.
	49	·50	1·00	.....	33·00	11·22	.....	.....	13.10	25·78	4·20	1·00	.....	.....	.....	.....	91·30	Do.
	50	Trace.	1·40	.....	29·60	11·56	.....	.....	7 50	43·25	6·34	Trace.	.....	.....	.....	.....	98·25	Do.
February 23, 1884	51	·80	·50	.....	35 75	31·24	.....	.....	16·20	.....	.....	.....	.....	.....	.....	.....	.....	Do.
March 5, 1884	52	1·60	·80	.....	36·25	31·10	.....	.....	17·90	3·61	.....	.....	.....	.....	.....	.....	.....	Do.
October 2, 1882	53	·05	·90	.....	33·50	31·90	.....	.....	17·90	.....	.....	.....	.....	.....	.....	.....	.....	Do.
March 13, 1884	54	Trace.	·70	.....	33·80	34·20	.....	.....	19·25	3·47	.....	.....	.....	.....	.....	.....	.....	Do.
March 17, 1884	55	1·20	·70	.....	33·80	30·20	.....	.....	20·75	4·14	.....	.....	.....	.....	.....	.....	.....	Do.
March 19, 1884	56	1·90	·70	.....	34·60	29·96	.....	.....	20·80	3·99	.....	.....	.....	.....	.....	.....	.....	Do.
March 21, 1884	57	1·50	·70	.....	34·40	29·87	.....	.....	19·80	3·89	.....	.....	.....	.....	.....	.....	.....	Do.
March 24, 1884	58	1·20	·50	.....	34·25	32·80	.....	.....	17·10	3·45	.....	.....	.....	.....	.....	.....	.....	Do.
April 3, 1884	59	1·70	1·10	.....	33 85	29·90	.....	.....	19·90	3·51	.....	.....	.....	.....	.....	.....	.....	Do.
April 7, 1884	60	1·30	·50	.....	33·20	30·34	.....	.....	20·60	3·50	.....	.....	.....	.....	.....	.....	.....	Do.
April 9, 1884	61	·80	·70	.....	33·10	30·69	.....	.....	19·80	4·75	.....	.....	.....	.....	.....	.....	.....	Do.
April 11, 1884	62	1·10	·50	.....	31·85	32·98	.....	.....	20·05	4·54	.....	.....	.....	.....	.....	.....	.....	Do.
April 14, 1884	63	1·05	·40	.....	31·95	30·90	.....	.....	22·75	3 22	.....	.....	.....	.....	.....	.....	.....	W. T. Page. 135-oz. bullion.
April 15, 1884	64	·45	·50	.....	33·00	28·93	.....	.....	23·65	3·42	.....	.....	.....	.....	.....	.....	.....	W. T. Page. 138-oz. bullion.
April 18, 1884	65	·50	·70	.....	32·90	29·11	.....	.....	22·00	2·86	.....	.....	.....	.....	.....	.....	.....	W. T. Page. 160-oz. bullion.
April 22, 1884	66	·60	·50	.....	33·00	26·89	.....	.....	23 95	3·00	.....	.....	.....	.....	.....	.....	.....	W. T. Page.
April 28, 1884	67	1·40	·60	.....	33·20	27·51	.....	.....	24·00	.....	.....	.....	.....	.....	.....	.....	.....	Do.
March 5, 1884	68	·50	·60	.....	34·60	30·09	.....	.....	22·00	2·67	.....	.....	.....	.....	.....	.....	.....	Do.
	69	.....	.....	.....	36·00	32·00	.....	.....	25·60	.....	.....	.....	.....	.....	.....	.....	.....	H. T. V. Furman. Pectolitic, fibrous.
	70	.....	.....	.....	32·00	36·47	.....	.....	24 23	.....	.....	.....	.....	.....	.....	.....	.....	H. T. V. Furman. Fine translucent crystals.
	71	.....	.....	.....	27·60	45·00	.....	.....	20·64	.....	.....	.....	.....	.....	.....	.....	.....	H. T. V. Furman. No lead found.
	72	.....	.....	.....	29·80	39·50	.....	.....	19·30	.....	.....	.....	.....	.....	.....	.....	.....	H. T. V. Furman. "Old German slag."
	73	.....	.....	.....	31·00	34·83	.....	.....	24 10	.....	.....	.....	.....	.....	.....	.....	.....	H. T V. Furman. Tetragonal crystals.
	74	.....	.....	.....	32·20	28·50	.....	.....	27·50	.....	.....	.....	.....	.....	.....	.....	.....	H. T. V. Furman. Almost cubes.
	75	.....	.....	.....	25·50	40·97	.....	.....	16·00	.....	.....	.....	2·70	7·62	.....	.....	.....	H. T. V. Furman. Aluminous.
	76	.....	.....	.....	35·80	25·50	.....	.....	29 50	·60	3·90	.....	1·36	.....	.....	.....	.....	H. T. V. Furman. Ran free.
	77	.....	.....	.....	37·60	20·07	.....	.....	29·23	·41	5·50	.....	4·68	.....	.....	.....	.....	H. T. V. Furman.
	78	.....	.....	.....	36·20	26·20	.....	.....	30·00	.....	.....	.....	.....	.....	.....	.....	.....	Do.
	79	.....	.....	.....	32·20	27·70	.....	.....	25·20	.....	.....	.....	.....	6·05	.....	.....	.....	Do.
	80	.....	.....	.....	35·80	23·74	.....	.....	28·20	6·65	.....	.....	.....	.....	.....	.....	.....	Do.
	81	.....	.....	.....	39·00	22·30	.....	.....	29·84	.....	.....	.....	.....	.....	.....	.....	.....	H. T. V. Furman. Very bad. Furnace closed
February, 1884	82	·35	b 88	.....	36·20	24·17	.....	.....	18·75	9·41	3·95	0	·88	4·67	.....	·83	98·86	W. T. Page. Resembles porcelain.
February 1, 1884	83	1·50	·30	.....	34·00	33·43	.....	.....	16·60	.....	.....	.....	.....	.....	.....	.....	.....	W. T. Page. 185-oz. bullion.
January, 1884	84	·20	·25	.....	32·50	29·06	.....	.....	28·50	·23	2 71	0	.....	3·60	.....	1·1	97·75	W. T. Page. 70-oz. bullion. Monoclinic crystals.
February, 1884	85	1·00	1·10	.....	37·70	35·48	.....	.....	14·00	7·48	.....	.....	.....	.....	.....	.....	.....	
	86	1·50	1·20	.....	35 30	35·35	.....	.....	18·00	3·87	.....	.....	.....	.....	.....	.....	.....	
	87	60	1·80	.....	37·00	36·38	.....	.....	13·50	8·39	.....	.....	.....	.....	.....	.....	.....	
	88	·90	1·30	.....	38·20	32·52	.....	.....	17·70	5·80	.....	.....	.....	.....	.....	.....	.....	
April, 1884	89	1·40	1·60	.....	36·50	38·57	.....	.....	15·00	7·20	.....	.....	.....	.....	.....	.....	.....	
	90	3·00	2·80	.....	37·50	41·65	.....	.....	5·30	10 30	.....	.....	.....	.....	.....	.....	.....	Old Leadville slag.
	91	·60	1·00	.....	31 50	41·52	.....	.....	16·50	6·07	.....	.....	.....	.....	.....	.....	.....	
	92	·60	·90	.....	33·80	36·22	.....	.....	15·90	8·52	.....	.....	.....	.....	.....	.....	.....	
	93	·80	·60	.....	35·70	38·95	.....	.....	15·40	5·54	.....	.....	.....	.....	.....	.....	.....	
	94	·50	1·00	.....	32·60	36·80	.....	.....	16·60	4·00	.....	.....	.....	.....	.....	.....	.....	
	95	1·25	1·50	.....	34·60	41·80	.....	.....	12·10	4·00	.....	.....	.....	.....	.....	.....	.....	
	96	1·25	1·50	.....	34·90	35·70	.....	.....	15·00	.....	.....	.....	.....	.....	.....	.....	.....	
	97	5·00	3·00	.....	40·00	17·70	.....	.....	22·30	.....	.....	.....	.....	.....	.....	.....	.....	Three h'rs after "blowing in."
	98	1·20	2·10	.....	38·00	27·60	.....	.....	11·30	.....	.....	.....	.....	.....	.....	.....	.....	
	99	.....	.....	.....	33·00	40·00	.....	.....	16·00	.....	.....	.....	.....	.....	.....	.....	.....	Type for impure ores—A.
	100	.....	.....	.....	33·00	33·00	.....	.....	23·00	.....	.....	.....	.....	.....	.....	.....	.....	Type for impure ores—B.

a By difference.

b By wet analysis.

spear-headed slag formation that is due to a marked deficiency in iron (or manganese), since the latter slag invariably contains considerable silver. The chief objection to the type D is the difficulty of obtaining it. When there is a scarcity of both iron and lime, and siliceous ores must be treated, I know of no better slag than that given by type D; these slags will invariably run very low in lead, and the silver will vary from half an ounce to two and a half ounces per ton, according to the grade of bullion and the lead charge.

Type E is a most excellent slag; it is a true singulo-silicate, and has the formula: $6FeO,3SiO_2 + 4CaO,2SiO_2$. This gives as the percentage composition:

	Per cent.
SiO_2	31·38
FeO	45·18
CaO	23·44
	100·00

By deducting 10 per cent as an allowance for other ingredients, we should obtain:

	Per cent.
SiO_2	28·24
FeO	40·66
CaO	21·10
	90·00

It is customary to carry at least 30 per cent SiO_2 in forming this type of slag. The CaO : FeO practically as 1 : 2; the physical properties are well marked.

"If," says Dr. Hahn, "the proper amount of fuel has been given to the charge, it will contain neither lead nor silver; and it is my opinion that if it ever is metalliferous, it is through small globules of matte dissolved in it, which have not been separated on account of lack of heat in the furnace. Running on such a slag, a furnace can never get out of order except through gross carelessness." I have previously stated that *all* lead slags contain at least *some* lead and silver, although the amounts may be small, perhaps merely a trace; yet I have never seen a slag which at the same time contained only a trace of lead and silver, although I have examined a very large number of slags which were claimed to be free from these elements. This slag is used to "blow in" a furnace, to loosen up crucible obstructions, and also immediately after "barring" the furnace hangings, with markedly good results. It allows a large tonnage, requires a comparatively small amount of fuel, and is, in short, an economical slag where it can be continuously run, but in certain localities where iron flux is quite scarce, it is not as profitable a slag as the types D, F, and G.

Type F is the next well-defined slag in the lime scale (see Fig. 4, and analyses Nos. 63, 64, 65, 66, 67, 68, and 84). The most perfect crystals I have noticed belonging to this type were carefully analyzed, giving the results as stated in analysis No. 84. This is a black, lustrous slag, distinctly resinous. The crystals are rectangular prisms, remarkably translucent, and in fact where there is little manganese present they are often transparent; the tops of a number of the crystals are slightly indented or hollowed out, like salt crystals. It is an exceedingly friable slag; the powder is mouse-colored. I am indebted to Mr. H. V. Furman for a specimen of this slag; to Mr. A. F. Schneider is due the discovery of the type. This slag contained only two tenths of an ounce silver and one quarter of one per cent lead, and is the freest from lead and silver of any slag I have even been able to find.

Type G is perhaps the best slag that has been discovered for the treatment of exceedingly siliceous ores. Mr. Raht, metallurgist of the Horn-Silver works, Utah, produced this slag with most excellent results, working ores containing considerable baryta, alumina, and zinc. If I am properly informed, Mr. Raht is the discoverer of this most excellent type, which first gained publicity through an article by Mr. Schneider. This slag crystallizes in the form shown in Fig. 1, and will usually contain from 25 to 30 per cent CaO. The pectolitic forms of these ligh lime slags are sometimes good.

The slag crystallizing in hexagonal plates, is sometimes good, but more often these indicate a bad slag according to my own experience. These hexagonal plates may be regarded as indicative of too high a percentage of lime, in forming the high lime slags. In attempting to flux exceedingly siliceous ores with lime alone, we shall obtain slag appearances. But while such slags are remarkably free from lead, the silver is alarmingly high; according to the experience of others, however, the very reverse has been observed. In making this high lime slag, where there is a great deficit in either iron or manganese, the fuel and the lead charge have little or no effect in reducing the silver losses.

In conclusion, it should be said that there is unmistakably some law governing the losses of both lead and silver in lead smelting. This law, it seems to me, has never as yet been clearly enunciated. We know that most highly crystalline slags are good; yet some slags that have no well-defined crystalline form are also good. Furthermore, it is known that most easily fusible and fluid slags are good, and yet this is not always the case. Why should one slag be good and another be bad? To say that there should be a certain ratio existing between the silica and the bases does not solve the problem. The fuel also has a very important bearing upon this question, and it is well known that coke alone will produce a cleaner slag than a mixture of coke and charcoal. While the use of charcoal will give an increased tonnage, it will also generally cause an increased loss in silver.

The dissemination of matte globules in the slag does not to my mind satisfactorily explain the silver losses, since I have detached perfectly pure crystals from the very heart of the pot from slags of all of the above given types, and as a general thing these crystals were found to contain a larger amount of silver than the main body of the slag; the lead contents will usually be less. It was once thought that silver losses were due largely to manganese by the formation of silicate of silver (that is, the nascent oxygen given off from the manganese oxides would oxidize the silver, and this would unite with silica and thereby be carried off into the slag). I have elsewhere shown the impossibility of this supposition, and that there is no good ground for believing that such a compound has ever been produced or can be.

Can it be possible that the amount of cyanogen existing in the furnace at different times when producing certain types of slag has any bearing upon this subject? Aside from the fact that there are certain well-known ratios that should exist between the silica and the bases present (for example, iron and manganese), and that lime has a most remarkable influence in cleansing the slag, we know little or nothing regarding this subject.

There seems to be some law governing the crystalline form and the amount of lime present, and it has been noticed that slags having different amounts of lime usually crystallize as follows:

Slags having 3 to 5 per cent CaO crystallize like Fig. 1 *a*.
Slags having 8 to 12 per cent CaO crystallize like Fig. 1 *a'*.
Slags having 15 to 18 per cent CaO crystallize like Fig. 1 *b*.
Slags having 19 to 22 per cent CaO crystallize like Fig. 1 *c*.
Slags having 23 to 25 per cent CaO crystallize like Fig. 1 *d*.
Slags having 25 to 27 per cent CaO crystallize like Fig. 1 *e*.
Slags having 30 to 35 per cent CaO crystallize like Fig. 1 *g*.

And, finally, two slags which have almost the same identical chemical composition will frequently give by assay very dissimilar results.

THE PRODUCTION OF CUT NAILS IN 1885.

The American Iron and Steel Association has received from the manufacturers complete reports of the production of cut nails and cut spikes in 1885. The production of 1883 was the largest ever attained. The decreased production of 1885 is very largely due to the stoppage of many Western nail factories for the last seven months of the year, in consequence of a disagreement over nailers' wages.

The Wheeling District, which includes the nail factories in West Virginia and in that part of Ohio that lies near Wheeling, has long been the most prominent nail-manufacturing district in the country; but Central Pennsylvania is also fast assuming prominence in this respect, owing to its increasing number of factories as well as the increasing capacity of established works. The following table shows the relative importance of these two districts for the past three years:

DISTRICTS.	1883. Kegs.	1884. Kegs.	1885. Kegs.
Wheeling District	2,202,410	1,991,570	1,297,136
Central Pennsylvania	960,941	1,083,996	1,472,797

The production of nails in each State in 1885 is shown in the following table, together with the increase or decrease as compared with 1884, the names of the States being arranged in the order of their production in 1885. Kegs of 100 pounds each.

STATES.	1885. Kegs.	1884. Kegs.	Increase or decrease. Kegs.
Pennsylvania	2,457,916	2,281,667	+176,240
Ohio	920,539	1,310,715	−390,176
West Virginia	778,069	1,098,611	−320,542
Massachusetts	654,318	557,195	+97,123
Illinois	376,361	712,650	−336,289
Indiana	274,271	443,234	−168,963
Virginia	226,437	207,678	+18,759
California	203,567	129,332	+74,235
New Jersey	181,680	305,307	−123,627
Alabama	137,000	100,000	+37,000
Kentucky	135,628	41,522	+94,106
Tennessee	98,851	120,164	−21,313
Wisconsin	86,257	162,851	−76,594
Colorado	64,310	55,944	+8,366
Nebraska	60,000	40,000	+20,000
New York	41,611	14,500	+27,111
Total	6,696,815	7,581,379	−884,564

The quantity of steel and combined iron and steel nails produced in 1885 was 1,824,027 kegs, or over 27 per cent of the total. In 1884, only 393,482 kegs, or 5 per cent of the total production, were steel nails.

A Big Diamond from South Africa.—In August, 1884, the arrival of the celebrated 457-carat-fine white diamond from South Africa and its subsequent purchase by a syndicate of London and Paris diamond merchants were announced. The gem were intrusted to the care of one of the most skillful cutters, who has been engaged on the stone during the past eight months, and expects to complete the work in April next. As anticipated, the stone will turn out the most wonderful "brilliant-cut" diamond on record, surpassing in weight, as also, it is believed, in color, purity, and luster, all the crown and historical brilliants of the world. The stone in its almost finished state weighs still 230 carats, but, in order to give it the best possible shape and luster, it is intended to reduce its weight to something under 200 carats. The Kohinoor weighs only 106 carats, the Regent of France 136¾ carats, Star of the South 125 carats, and the Piggott 82¼ carats. The Great Mogul weighs 279 carats. It is, however, a lumpy stone, only rose-cut, and if cut to a proper-shaped brilliant it would probably not weigh more than 140 carats.

The Physical Constitution of Cast-Steel.—Some very interesting experiments with regard to the cellular structure of cast-steel have been carried out at the Creusot Works by MM. Osmond and Werth. They found that, if the thinnest conceivable sheets of the metal are placed on glass and covered with nitric acid, the iron will be dissolved, while the skeleton remaining, revealing the distribution of the carbon in the steel, will, on examination by the microscope, furnish undoubted evidence that such distribution is by no means uniform, and that the cast-steel consists of minute granulations in soft iron, separated, for the most part, by partitions made up of a different substance, a carburet of iron. In other words, cast-steel is cellular in structure, the iron constituting the kernel and the carburet of iron the shell. The elementary or simple cells thus constituted come together in composite cells or separate agglomerations in the thin sheets, which are thus rendered transparent by empty lines. These latter outline closed polygons of relatively large dimensions in the cast-steel, but the polygons become smaller and broken up proportionately to the more perfect manipulation of the metal.

THE PRODUCTION AND CONSUMPTION OF COPPER IN 1885.

By Charles Kirchhoff, Jr., Agent U. S. Geological Survey.

Recognizing how important it is to publish at an early date the results of the compilation of the statistics of the production of copper in the United States in 1885, the following figures are submitted as a preliminary report, from which the final data will vary only by so small a percentage of the totals that it may be accepted as substantially correct by the trade.

Territorially distributed, the production of the United States in 1885 has been as follows, as compared with previous years. For 1884, some modifications have been made in some of the figures, since official returns have been obtained in a few instances that were refused a year since:

TOTAL COPPER PRODUCTION IN THE UNITED STATES IN 1882, 1883, 1884, AND 1885.

SOURCE.	1882.	1883.	1884.	1885.
	Pounds.	Pounds.	Pounds.	Pounds.
Lake Superior	56,982,765	59,702,404	69,353,202	72,148,172
Arizona	17,984,415	23,874,963	26,734,345	22,706,366
Montana	9,058,284	24,664,346	43,093,054	67,798,864
New Mexico	869,489	823,511	59,450	79,839
California	826,695	1,606,862	876,166	469,028
Colorado	1,494,000	1,152,652	2,013,125	1,146,460
Utah	605,880	341,885	265,526	126,199
Wyoming	100,000	962,468	.....	.....
Nevada	350,000	288,077	100,000	8,871
Idaho	.....	.....	46,667	40,381
Missouri	294,695	260,306	230,000	.....
Maine and New Hampshire	290,000	212,124	249,018	211,602
Vermont	1,265,000	400,000	655,405	
Southern States	400,000	395,175	317,711	40,199
Middle States	.....	64,400	2,114	190,641
Lead desilverizers, etc	125,000	782,880	950,870	910,144
Total domestic copper	90,646,232	115,526,053	144,946,653	165,875,766
From imported pyrites and ores	1,000,000	1,625,742	2,858,754	6,056,841
Total, including copper from imported pyrites	91,646,232	117,151,795	147,805,407	170,962,607

The Montana product this year is compiled from official returns from all the largest producers, only small mines being missing. As the bulk of this product goes to the works of the larger producers by purchase of ores and concentrators, only a small error can have been made by estimating the copper contents of the ore and concentrate shipments made to foreign countries.

The following is, in detail, the output of the Lake Superior mines. In the majority of cases, it is the official product, based on smelting-works' returns; in a few instances, an official estimate of the ingot product based on the known output of mineral. The Mass is the only large mine in the case of which the ingot was estimated from the published statement of the output of mineral. The total is accurate, therefore, within a few thousand pounds.

THE PRODUCTION OF LAKE COPPER MINES IN 1880, 1881, 1882, 1883, 1884, AND 1885.

MINES.	1880.	1881.	1882.	1883.	1884.	1885.
Calumet & Hecla	31,675,239	31,360,781	32,053,539	33,125,045	40,473,585	47,247,990
Quincy	3,696,263	5,506,848	5,665,796	6,012,239	5,650,436	5,848,530
Osceola	3,383,537	4,179,976	4,176,782	4,256,409	4,247,630	1,945,208
Franklin	2,336,466	2,677,932	3,264,120	3,488,708	3,748,652	4,007,105
Allouez	1,318,471	1,473,107	1,683,557	1,751,376	1,928,174	2,170,476
Atlantic	2,341,195	2,528,009	2,631,708	2,682,197	3,163,585	3,582,633
Pewabic	970,509	1,876,244	1,482,666	1,171,847	227,834	.....
Central	2,026,078	1,418,465	1,353,597	1,268,556	1,446,747	2,157,408
Grand Portage	67,860	26,264	757,598	735,598	255,860	.....
Conglomerate	233,814	386,091	734,249	222,117	1,198,691	.....
Mass	517,159	467,684	737,440	659,474	481,396	365,000
Copper Falls	6,615	669,121	587,500	804,000	891,168	1,168,000
Phœnix	436,010	409,357	537,177	512,291	631,004	344,355
Hancock	3,037	571,897	540,575	484,906	562,636	203,037
Huron	70,285	254,515	364,579	729,213	1,927,660	2,252,484
Ridge	223,353	235,606	102,936	60,155	74,030	63,390
St Clair	13,195	135,493	87,126	135,225	139,407	.....
Cliff	78,962	79,382	66,053	10,374	28,225	.....
Wolverine	.....	.....	25,623	699,622	751,763	328,610
Nonesuch	55,584	119,061	26,450	.....	23,867	28,484
Isle Royal	79,469	47,308	35,477	.....	16,074	.....
Minong	27,407	15,397	21,380	3,582	.....	.....
National	.....	.....	17,060	26,006	87,368	162,252
Minesota	26,033	24,227	10,672	6,226	1,144	12,608
Belt	.....	.....	5,625	16,402	130,851	27,433
Sheldon & Colum	26,934	10,031	3,299	.....	9,828	.....
Aztec	3,757	.....	3,129	.....	.....	.....
Adventure	2,951	7,500	429	.....	4,333	4,000
Peninsula	.....	.....	.....	849,400	1,225,981	.....
Tamarack	.....	.....	.....	7,435	.....	181,669
Ogima	5,885	16,776	4,207	3,000	1,106	12,000
Concord	10,464	28,849	.....	.....	.....	.....
Evergreen Bluff	10,651	968	.....	.....	954	1,500
Flint Steel River	28,080	4,140	.....	.....	.....	.....
Madison	.....	1,534	.....	.....	.....	.....
Northwestern	916	.....	.....	.....	.....	.....
Ash-Bed	.....	24,804	72,636	.....	1,517	.....
Centennial	.....	.....	83,654	.....	.....	.....
Co.'s, Tributers	6,166	1,642	.....	.....	21,696	34,000
Total	49,718,337	54,548,909	57,155,980	59,702,404	69,353,202	72,148,172

The figures given under "lead desilverizers" in the general table are the closest approximation obtainable by a study of the returns from the lead desilverizing works, who usually report to this office separately their make of bluestone and of matte. The total stated under "imported pyrites and ores" may include some copper from domestic pyrites, since it is impossible to separate them in some cases. It may be stated, however, that fully 4,000,000 pounds can be traced to a foreign source directly.

Consumption.—So much has been said concerning the growth of the copper consumption in this country, stimulated by low prices, that an effort was made to get at some clear numerical expression, that might serve as a guide to the trade. Mr. George W. Cope, of Philadelphia, Secretary of the American Iron and Steel Association, a skilled statistician, kindly consented to receive the confidential returns of consumers, and in reply to inquiries the following companies and firms, among whom, it will be noted, are all but two or three of the great manufacturers of brass and copper in the United States, sent the figures covering their consumption of copper bars, ingots, cakes, and slabs:

Coe Brass Manufacturing Company, Torrington, Conn.; Waterbury Manufacturing Company, Waterbury, Conn.; C. G. Hussey & Co., Pittsburg, Pa.; Manhattan Brass Company, New York; New Haven Copper Company, Seymour, Conn.; Bristol Brass Company, Bristol, Conn.; Plume & Atwood Manufacturing Company, Waterbury, Conn.; Holmes & Wessel Metal Company, New York; Bridgeport Brass Company, Bridgeport, Conn.; Wallace & Sons, Ansonia, Conn.; Waterbury Brass Company, Waterbury, Conn.; Shelton Brass Hardware Company, Birmingham, Conn.; United Brass Company, Lorain, Ohio; Haydenville Manufacturing Company; Detroit Brass and Copper Company, Detroit, Mich.; Baltimore Copper Rolling Mill Company, Baltimore, Md.; Benedict & Burnham Manufacturing Company, Waterbury, Conn.; Ansonia Brass and Copper Company, Ansonia, Conn.; Stanier & Laffy, New York; John A. Roebling's Sons' Company, Trenton, N. J.; Holmes, Booth & Haydens, Waterbury, Conn.; Scovill Manufacturing Company, Waterbury, Conn.; Seymour Manufacturing Company, Seymour, Conn.; E. Miller & Co., Meriden, Conn.; Cheshire Brass Manufacturing Company, Cheshire, Conn.; Osborne & Cheeseman Company, Birmingham, Conn.; Taunton Copper Manufacturing Company, Taunton, Mass.; De Witt Wire Cloth Company, New York; Rome Iron-Works, Rome, New York; New Bedford Copper Company, New Bedford, Mass.; James G. Moffatt; Revere Copper Company, Boston, Mass.

In the aggregate, these works consumed 50,011,471 pounds of copper in 1885, against 43,151,960 pounds in 1884, thus indicating a rate of increase of 16 per cent. These figures, it should be distinctly stated, cover only a part of the consumption. They ignore entirely the large quantity annually distributed by dealers; but they do furnish tangible evidence of the growth in the consumption, which is all the more encouraging in times of general business depression, when the consumption of such leading articles as iron and steel remained practically stationary.

One as yet insuperable barrier to any reliable estimates concerning the total copper consumption in this country is the absence of data on stocks. It is possible, therefore, to ascertain only with a fair degree of accuracy how much of the copper product of the country has remained here, and how much has gone abroad. Another difficulty is encountered through the fact that the returns of the Bureau of Statistics do not give the copper contents of the "ore," including concentrates and matte exported. This has been overcome largely through special returns from the refiners giving the source of the copper handled by them. The bulk of the "ore" exported is Montana produce; some of it, however, is matte obtained from smelting the cinder from roasting imported pyrites for the manufacture of sulphuric acid. From the data obtained, the following estimate has been made:

	Pounds.
Production, 1885, and excess of imports of fine copper in ore	170,962,607
Imports of pig and old	574,514
Total supply	171,537,121
Exports, ingots and bars	36,221,931
Exports, copper contents of "ore"	50,050,000
Re-exports of foreign ore	348,020
Total exports	86,619,951
RECAPITULATION.	
Production and imports	171,537,121
Exports	86,619,951
Available for home consumption	84,917,170

In the report for 1884, published in the *Mineral Resources of the United States*, the consumption was estimated at 80,000,000 pounds. In the light of the data received from consumers, it is fair to assume that, if the figure for 1884 was correct, that for 1885 must have reached at least 90,000,000 pounds, and that, therefore, there must have been a drain on stocks during the year just passed. This, with the prospect that, at present prices, there will be no material increase in the output, but that, on the contrary, there is some prospect of a falling off in some quarters, is the most encouraging feature in the present position of the metal.

BROOKLYN, N. Y., March 10, 1886.

Coal Production of Montana, Wyoming, Colorado, and New Mexico in 1885.—The following is a statement of the coal mined during the year 1885 in the Rocky Mountains. The statistics are furnished by the courtesy of the Division of Mining Statistics and Technology of the United States Geological Survey, of which Mr. Frederick F. Chisolm is agent. The tons are of 2000 pounds:

MONTANA.	
Total product in tons	86,215
WYOMING.	
Total product in tons	807,328
COLORADO.	
Product by counties, in tons:	
Weld	37,278
Boulder	182,489
Jefferson	22,719
Douglas	1,500
Park	43,752
El Paso	44,083
Fremont	327,038
Las Animas	463,731
Huerfano	89,566
La Plata	15,747
Dolores	3,240
Gunnison	120,359
Garfield	4,800
Total for the State	1,356,062
NEW MEXICO.	
Total product in tons	304,106

THE MANUFACTURE OF FIRE-BRICK AT MOUNT SAVAGE, MARYLAND.*

By Robert Anderson Cook, A.M., Mount Savage.

The subject of refractory materials occupies such an important position in all metallurgical works, and particularly in those of iron and steel, that any data concerning it must be of interest to the metallurgist. No apology is needed, therefore, for this attempt to describe the mining of fire-clay and the manufacture of fire-brick at one of the largest establishments in this country.

Mount Savage is a small village situated in the northwestern part of the Cumberland coal basin, on the Cumberland & Pennsylvania Railroad, and at the foot of Savage Mountain, from which the village takes its name.

Fire-brick have been manufactured here almost, if not quite, as long as in any place in America; and as the brick are still shipped to nearly half the States in the Union every month, the manufactory is probably the most generally known.

In the year 1837, a company was formed called the Maryland & New York Coal and Iron Company. It built two blast-furnaces, the ruins of which still remain. It was in the construction of these furnaces that the first fire-brick made here were used; and though the iron-works ran but spasmodically, the brick-works have been in constant operation ever since.

From 1837 until 1846, the Maryland Coal and Iron Company, from then until 1848, the Lochiel Iron Company, and from 1848 until 1864, the Mount Savage Iron Company, ran the brick-works, and in connection with them the blast-furnaces and extensive rolling-mills. In 1864, the Consolidation Coal Company ran the entire works; and it was not until 1868 that the iron manufactory was given up, with the exception of the foundry. In 1870, the Union Mining Company of Alleghany County was formed, and is now engaged in the manufacture of bricks from the mine that was opened about 1841.

The Clay Mine.—The mine is situated on the South side of Savage Mountain, three miles from the works by the tram-road. The bed of clay crops out along the summit of the mountain, and runs nearly northeast and southwest. The only other mine on this bed is a very small one, two miles southwest from that of the Union Mining Company. The clay from this mine is brought to Frostburg, where it is manufactured into brick.

The large bed was first opened on the outcrop, and for a number of years all the clay was dug from open pits, and hauled at great expense down the mountain in wagons to the works. Finally, when this method of mining had been carried on as long as was economical, the mine began to be worked systematically, and levels were driven on the outcrop, on one side, wherever it could be reached by reason of the formation of the hill. From this level, galleries were driven at an angle up on the bed, clear through to the old workings. Chambers were driven out from these galleries, connecting the galleries as often as the nature of the ground would permit. When these chambers are all driven through, that part of the mine is robbed of as many of the pillars between the chambers as it is practicable and safe to remove. There are several of these levels driven, the last one about 100 feet below the next above, and as the bed dips about one foot in every four on an average, one can calculate on the amount of clay each level will yield. From the present outlook, there is enough to run the works for a great many years.

At the time this more systematic mining was begun, some cheaper mode of transportation was also sought. First, a wire tram on the English system was tried, consisting of an endless wire rope, with buckets of the capacity of fifty pounds, and a stationary engine of eight horse-power at the bottom. This plan involved much trouble, and never could supply the requisite amount of clay, and when winter came, with its extreme cold and snow, the plant was practically useless. Then the regular three-rail incline was adopted, which is in common use in this coal region, and which has worked well ever since. The only peculiarity of this incline is its great length. It is a mile and a quarter long, and the rise from the bottom to the top is 1240 feet. Six cars run upon it at a time; three loaded ones coming down haul up the three empty ones. The rope is of steel, five eighths of an inch in diameter, and runs over two shive wheels twelve feet in diameter, on each of which is a band brake. One man to run these brakes, two men to load, one man to unhook at the bottom, and one to look after the rollers on the incline, are all that are necessary to run 100 tons of clay a day. The cars when empty weigh 1800 pounds, and two tons of clay are loaded on each car. It takes seven minutes, on an average, to run one trip. This is said to be the longest gravity road of its kind in the world. From the bottom of this incline, the loaded cars run down by gravity on a tram-road to the brick-yard, and the empty cars are hauled back by mules to the foot of the incline.

The bed of clay lies at the very bottom of the coal measures of this basin. On top of the clay, lies an 8-inch bed of coal; beneath it, lie from three to four feet of shale; and then comes the conglomerate rock that marks the boundary of this basin. The bed of clay varies from eight to twenty feet in thickness.

The clay is divided into two varieties, the hard and the soft; and these are distinguished by their physical properties. One of these varieties is of a medium gray color, shading almost to black. This clay is very hard, and rattles like crockery when thrown into the chutes. It has a distinct, though not regular, conchoidal fracture; it is non-plastic unless ground to an impalpable powder; and does not crumble much when exposed to the weather in heaps, being affected for only about three or four inches from the surface, though exposed for years. In parts of the mine, this clay, when finely broken, is sharp enough to cut one's hands.

The other variety is a very plastic clay of much lighter color, weathering very rapidly, and in one season's exposure crumbling to powder.

The peculiarity of this deposit is, that the two clays are so intermixed in the same bed and in such a way that in the present development of the mine there is no accounting for the difference in structure of the clay. In one place, the bed will be full from roof to floor of hard clay; and in another place, within a few feet of the former, the clay will all be soft. These sudden changes can not be accounted for. Usually the soft clay lies on top of the hard and acts as a sort of protector for it, keeping off the coal-water. In some places, again, there is a gradual change from one to the other, from hard to soft and back again; and often the hard clay lies between layers of the soft. This is what causes the difficulty in the mining work and makes it seem irregular; for where the hard clay is struck, small pillars and large chambers are made, and *vice versa*.

The impurities in this clay are much the same as in all other clays, except that they are fewer and smaller in amount. There are some balls of iron ore found in the bottom of the bed, but these can readily be seen. The most objectionable impurity is iron pyrites, which is found in the slips of the soft clay, and particularly in the casts of roots in that variety. The detection of this iron pyrites is impracticable until after the bricks have been subjected to the intense heat of the kiln, when discoloration is shown in spots on their surfaces.

The coal that is used at the works is obtained on the property from the coal measures above the clay. It is mined from a vein twenty-two inches thick, and is brought down to the head of the tram-road by a short incline, and there it is run in with the clay, and trains made up of both are run down to the brick-yard.

A good many analyses of this clay have been made, at various times and by different chemists.; but it would not be safe to take any one of the various results as a test, for the difference in them is probably due as much as to the chemists as to the samples. The following is an average of several results, which will probably give as accurate an analysis as one could obtain:

Silica	55·75
Alumina	33·23
Impurities	2 06
Water	10·37

The Brick Manufacture.—The plant for carrying on the manufacture of brick here is as complete as can well be found. There is a foundry and a machine-shop where every machine used in the manufacture of the brick is made. The rollers and pans for crushing the clay, the tempering-pans, presses (hand and steam), are all made entirely at the works, so that all varieties of shapes of brick can be made and pressed. The works are complete for turning out all brick from the smallest nine-inch shape, weighing three pounds, to the largest glass-house shapes, weighing three thousand pounds.

The kilns for calcining the clay are built of brick, with a boiler-iron shell. They are fifteen feet high, and eight feet in diameter, with fire-holes a few feet from the bottom. The top is dome-shaped, with a chimney from the center having a damper on top. The clay is charged in through a hole near the top of the dome, and is drawn out at the bottom of the kiln on iron plates, through two drawing-doors, one on each side of the kiln, twenty tons being the daily product of one kiln.

"The most important constituent is the calcined clay or chamotte. This will not shrink, and possesses the power of union in the greatest possible degree."* These two important qualities have more to do with the production of a brick, regular both in size and in quality, than any other features in the material or process employed.

Another advantage in calcining clay is, that it enables one to throw aside any clay in which there are impurities that may have been previously overlooked, since these are much more easily seen when the clay has been burned. The proportion used must, of course, vary with the size of the brick or tile, and the particular use for which it is intended.

From the crushing-pan, which consists of two heavy rollers on a revolving grate, the clay goes by an elevator, through the screens, into a hopper above the tempering-pan. This pan is on the same principle as that used in crushing, except that, instead of having a grate-bottom, it is of solid iron. The clay is carried to the tables of the various molders by an endless belt. The brick are all molded by hand. They are dried on a brick floor, heated by flues running the whole length of the yard. When dry enough, they are pressed in hand-presses unless they are too large. In that case, they are made in a steam-press at first, and smoothed up by hand when dry enough. No machine for molding is used here, though it was tried at one time with more or less success, but the bricks were never as even and regular as they are now.

After the bricks are molded, pressed, and thoroughly dried, they are ready for the kilns. The kilns used here are of two varieties. One is the regular down-draught kiln, rectangular in shape, with fire-holes on two sides, and a flue in the bottom, running the whole length of the kiln, having a direct connection with a stack at one end, which gives the draught. Breasts of bricks are built in front of the fire-holes, to protect the brick nearest the fire from direct contact with the flame.

The other is a gas-kiln, having some of the peculiarities of the Hoffman, in that some solid fuel is used, and also the heat from the burning bricks dries the brick gradually. In these two points, it resembles the Hoffman kiln, but it differs from that in not being a continuous kiln, being rectangular in shape, instead of elliptical, and using gas for its principal fuel. The kiln is two hundred feet long, forming a tunnel with rows of holes through the roof for the admission of the gas and coal. These holes are provided with iron caps, which can easily be removed. Along one side of the kiln is a flue leading to the stack, and flues leading out at right angles to this run across the kiln, so that the gas comes in at the top and goes out at the bottom. At one end of the kiln, are fire-holes, and the brick are set at this end first, and the kiln set full for a certain distance. Care is taken to leave a clear space under each hopper in the roof, so that the fuel can go to the bottom. Iron plates are used to shut off the brick already in the kilns from the men setting the bricks, and these plates are made tight by smearing them with clay, making of each section a chamber by itself. The fires are lighted, and burn very slowly for a time until the first brick are gradually but thoroughly heated, when some fine coal is dropped in through the roof. The gas is then admitted through the holes in the roof, and the fire-holes are tightly closed, only enough air being admitted through the red-hot bricks for the combustion of the gas.

The gas-producer is on a truck, which runs on a track the full length of the kiln; and as fast as the brick are burned, it is moved along the kiln. As it progresses, the iron plates are drawn out and placed further up the kiln, adding new chambers. The brick are very gradually dried in this way, and a greater heat is developed with less cost in this kiln

* A paper read at the Pittsburg Meeting of the American Institute of Mining Engineers, February, 1886.

* *Die Feuerfesten Thone*, von Dr. Carl Bischof. Leipzig, 1876, p. 168 (1).

than in any of the down-draught kilns, which are heated in the ordinary direct way with coal.

This kiln will hold three hundred thousand brick, and it takes thirty days to burn it from end to end. One man and a boy are all that are necessary to run the producer, except when it must be moved.

The combined product of the works amounts to the equivalent of something over twenty thousand nine-inch bricks a day.

The writer has been employed by the Union Mining Company in making such tests as seemed to be desirable to keep the brick up to the best form for any change that might take place in the market. It was not intended that other clays should be bought to mix with those found here; and from tests made here of brick from other places, and calculations from analyses of other clays, it is doubtful whether any could be procured that would be of any advantage in the general run of fire-brick work.

For the calculations in getting at the value of fire-clay from its analysis, the formula used was one given by a German chemist, Dr. Carl Bischof, who is a recognized authority on the subject of refractory materials, and whose investigations on the subject have been carried out and verified to some extent in this country. He divides the clay into two parts, the silica and alumina constituting the refractory part, and the impurities the fluxing part. Dr. Bischof, in this formula, uses the impurities as a whole, but in another he divides them according to their relative strength as fluxing agents.

Taking the alumina divided by the total impurities as a dividend and the result of the silica divided by the alumina as a divisor, the quotient will be a measure of the refractoriness of the clay as compared with that of another clay treated in the same way. Calling RO the impurities, the formula will be as follows:

$$\frac{Al_2O_3}{RO} \div \frac{SiO_2}{Al_2O_3}$$

As small a difference as 0·05 between the quotients thus obtained for two different clays indicates a difference in refractory quality that will show itself, other things being equal, in a furnace test.

These calculations are of great use in comparison of different clays; but the result one might expect from them may be entirely changed when the clays are made into brick. The physical qualities of all clays must be tested before an absolutely perfect comparison can be made. A sample of the same clay being used by two different brick-makers, yet the one brick made from it may not be as refractory as the other, though the sample may have been thoroughly mixed; for if in one case the clay be coarsely and in the other finely ground, the coarse one will stand a great deal more heat than the other before it vitrifies to a homogeneous mass.

This has been often observed before; and the writer has found it perfectly true, as regards this clay, that the more finely it is ground, the less refractory it becomes. At the same time, the more finely it is ground, the stronger and harder the brick becomes, the more abrasion it will stand, and the less likelihood there is of its being broken in handling. Though refractoriness is an essential of fire-brick, yet it is not the only one.

For the various positions in which the brick are placed, and the duties they are expected to perform from the upper part of a blast-furnace where the heat is low, and the abrasion of stock is the greatest element in the destruction of the brick, to the ports of an open-hearth steel furnace, where intense heat is the most destructive element, particular mixtures of clay should be made, to get the best results from raw materials.

The greatest trouble of a brick manufacturer is, that he can not be sure for what purpose the brick will be used, or in what position in the furnace they will be placed. Another trouble is, to find out where the fault lies, when complaint is made. This is almost impossible. It may be in the construction of the furnace, or in bad bricklaying, or in the grade of the brick, or that the brick were not hard-burned. And if a sample lot of brick is sent to a mill to be tested, the chances are that, when the superintendent is asked how the brick stood the test, he will have forgotten all about them. The only way for a manufacturer to test the brick is to build a furnace and test them himself, and to do this under as nearly as possible the same conditions as those under which they will be used in practice.

The furnace used by the writer for making such tests had nearly the form of a puddling-furnace. One half of it was built of one mixture and the other half of another, running through the furnace from end to end. Bridge-wall, roof, side-wall, and neck would show how the brick stood in each position. From the results of the tests, a fair comparison could be obtained of the value of the brick. The draught was a direct one to the foot of a large chimney, and the coal used was a mixture of the best Cumberland coal and our own. A brick of the mixtures used in building the furnace was taken as a standard. One of these bricks, with another, either of some other mixture, or some brick that we wished to test, were placed side by side in the neck of the furnace, which was then fired as hard as possible for a certain length of time. When the furnace had cooled off, the bricks were removed, and the effect carefully noted, particularly as regards shrinkage and vitrification, and the effect of the heat on the furnace was also noticed. The heat in thirty-six hours was intense enough to vitrify any brick, but not enough to destroy them.

As the demand now is for a hard-burned brick, the difficulty of spotted bricks arises. These are bricks that appear to be of poor quality; for though a clay may not contain more than one per cent of oxide of iron, yet if it is exposed to a great heat, these spots will show; and at present, buyers, with the exception of a few who have learned their value, will not take spotted bricks. All the brick from other places that the writer has tested will, when exposed to our greatest heat, show some spots, although, as they come out of an ordinary kiln, they are free from spots.

The two peculiarities that have made this fire-clay so famous are its freedom from impurities and the fact that it contains such a proportion of silica to the alumina that the brick, after they have been hard-burned, will swell a little instead of shrinking, no matter how much they are heated.

The care that the company has taken in preparing its product for market has borne fruit in the gradual increase of its sales from year to year.

NOTE ON THE USE OF GASOLINE GAS IN A CHEMICAL LABORATORY.*

By Professor Charles E. Wait, School of Mines, Rolla, Mo.

Having had some experience in the use of gasoline gas in a laboratory, I have been induced by frequent inquiry to present a few hints concerning it, which I hope may be of some value to those who are out of the reach of coal-gas, and who contemplate using this gas.

While I will not delay to describe the method by which this gas is made, it may not be out of place to note that, unless frequent charges are put into the carburetter, the gas is variable in richness. This may be partially avoided, it is said, by repeatedly pumping from one cell in the carburetter to another.

If a machine is in constant use for many months without recharging, the gas becomes rather poor for illuminating purposes; but in this condition it may be burned in a Bunsen burner with advantage. Could the gas be used always in this condition, no difficulty would be experienced, and it would be quite satisfactory for general laboratory purposes. Considerable annoyance, however, is experienced whenever the machine is filled with gasoline. The Bunsen and other burners then produce a flame too smoky to be used with comfort, and, in fact, with most of them, a full supply of air, turned on at the base of the burner, will not suffice to completely burn off all the carbon.

Finding it necessary to adopt some method by which I could get a flame free from unconsumed carbon, I adopted a plan that has in every way proved satisfactory.

In addition to the pipe conveying the gas to the table, and arranged with a stop-cock, there is brought to the table, within a few inches of the gas-pipe, another pipe, conveying air directly from the pump. This pipe is also arranged with a stop-cock. The air and gas-pipes are now connected with one pipe by a T-joint; and to this last pipe is attached, by rubber tubing, the Bunsen or other burner.

I have successfully used this simple system in connection with both small and large Bunsen burners, a burner with three tubes, and a Fletcher burner, and recently I have added a new still to our equipment, and have been using with it a Fletcher special high-power burner No. 6, to which this system has been applied. With a combustion-furnace, having fifteen burners, I have found the use of the air as above described satisfactory.

Bunsen burners may be altered to burn this gas, and, after some practice, I have been able to secure the desired results; but, for the production of both small and large flames, with and without the rose, I have found the use of air as above described about all that could be desired.

I have just received a new burner that was made for general laboratory use, designed to burn this gas, and sent to me for trial; but have not yet given it a sufficient test to enable me to speak concerning its merits.

Statistics of the Breakage of Pit-Ropes.—*Dingler's Polytechnisches Journal*, vol. cclviii., 1885, page 140: abstracted in the Minutes of the Proceedings of the Institution of Civil Engineers of London: In the Dortmund District of the Westphalian coal-fields, an account has been kept of the wear of the ropes of the different collieries since 1871, from which the following table has been compiled for the thirteen years, 1872–1884. During this period, 2669 ropes have been laid aside as worn out, and of these 186, or 7·85 per cent, broke suddenly while at work. Classified according to shape and material, the results were:

	Total.	Broken sud'ly.	Per cent.		Total.	Broken sud'ly.	Per cent.
Flat cast-iron rope..	207	19	9·18	Flat hemp rope.....	8	...	...
Flat soft iron "	147	19	12·90	Round cast-steel rope.	1118	42	3·75
Flat aloe fiber "	74	6	8·11	Round soft iron "	815	100	12·30

The number of broken ropes in the different years were:

	Total.	Broken suddenly.	Per cent.		Total.	Broken suddenly.	Per cent.
1872.....	114	22	19·30	1879.....	172	9	5·32
1873.....	198	22	14·10	1880.....	170	8	4·70
1874.....	156	19	9·64	1881.....	165	8	4·85
1875.....	226	19	8·40	1882.....	194	15	7·73
1876.....	227	15	6·91	1883.....	187	8	4·27
1877.....	178	16	8·98	1884.....	190	6	3·16
1878.....	202	19	9·40				

Whence it appears that, with a few interruptions, the proportion of failures of pit-ropes by sudden breakage to those regularly worn out has continuously diminished during the thirteen years that the operations have been carried out.

Prizes Offered this Year by the Paris Academy of Sciences.—Geometry: A study of the surfaces admitting all the symmetrical planes of one of the regular polyhedrons—3000 francs; Francœur prize, the work most conducive to the progress of the pure and applied mathematical sciences—1000 francs. Mechanics: Extraordinary prize of 6000 francs, for any work tending most to increase the efficiency of the French naval forces; Montyon—700 francs—invention or improvement of instruments useful to the progress of agriculture, of the mechanical arts or sciences: Plumey—2500 francs—improvement of steam-engines or any other invention contributing most to the progress of steam navigation; Dalmont—3000 francs—the best work by any of the Ingénieurs des Ponts et Chaussées in connection with any section of the Academy. Astronomy: Laland prize—gold medal worth 540 francs—for the most interesting observation on work most conducive to the progress of astronomy; Damoiseau—10,000 francs—best work on the theory of Jupiter's satellites, discussing the observations, and deducing the constants contained in it, especially that which furnishes a direct determination of the velocity of light; Valz—460 francs—for the most interesting astronomical observation made during the course of the year. Physics: Grand prize of the mathematical sciences—3000 francs—for any important improvement in the theory of the application of electricity to the transmission of force. Statistics: A prize of 500 francs for the best work on the statistics of France. Chemistry: Jecker prize—5000 francs—for the work most conducive to the progress of organic chemistry. Geology: Vaillant prize, on the influence exercised on earthquakes by the geological constitution of a country, by the action of water or of any other physical causes.

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* A paper read at the Pittsburg Meeting of the American Institute of Mining Engineers, February, 1886.

THE COPPER INDUSTRY IN THE CAUCASUS.

The Russian government, says *Engineering*, is devoting some attention to the copper industry, which has languished of late years in all parts of the empire except in Transcaucasia, where Messrs Siemens have given it a considerable impulse by the erection of several smelting-works and the export of the metal to the markets of Persia and Central Asia. According to an official report published by the Minister of Finance this week, Russia, which in 1856 exported 3000 tons of copper yearly and imported only 500 tons, now imports 10,000 tons and exports only 2000 tons. In this manner, Russia, from being an extensive exporter, has become dependent on foreign countries for her supply, and in the mean while many old-established copper mines have had to be closed, owing to the impossibility of competing with the foreign article. The Ural region, formerly boasting of twenty-two smelting-works producing 5000 tons of copper yearly, now possesses only ten works smelting a little over 1000 tons per annum. In the Kirghiz steppes and in the interior of Finland, there are extensive deposits of copper ore, but in the existing condition of the market, it is useless to think of working them. The Caucasus alone presents any progress at all. Along the banks of the River Tchorokh, in the Batoum District, are immense deposits; and although the malaria has impeded the development of the Tchorokh group, the Zangezour group, to the southeast, produces 300 tons a year. Much of this is consumed by the neighboring village of Lantchi, where 80 families are engaged in making copper goods for Persia. Messrs Siemens's works are situated in the Elizavetopol Government, and the output of copper is there over 3000 tons a year. The ore is obtained from six galleries in the Mis-Dagh Mountain, and is smelted by charcoal from a forest of 8000 acres belonging to that firm. Upward of 1500 Persians, Greeks, Armenians, and Tartars are employed in the works, and the two establishments are connected by twenty miles of narrow-gauge railroad, costing £80,000 to put down. Respecting the richness of the copper mines in the Caucasus, we may mention that in the Tionet and Telaff Districts of the Government of Tiflis there is a deposit of copper ore, estimated to consist of upward of 70,000,000 tons. Fuel being cheap in the Caucasus, and good markets at hand, it is expected that the industry will shift itself thither completely from the Urals in a few years' time.

ELECTRICAL DEPOSITION OF FUMES.

Written for the Engineering and Mining Journal by F. L. Bartlett, Portland, Me.

In Mr. Malvern W. Iles's interesting articles on the condensation of fume, he mentions that the use of electricity presents a promising field for success. I had considerable faith in the use of electricity until I had quite thoroughly covered the ground by experiments in a somewhat large way; and I am now doubtful of the utility of electricity for depositing fume of any kind, though possibly my experiments may have been crude and not in accordance with the correct principles for the application of electricity.

Briefly, they were as follows: I first procured a small Holtz machine with plates less than 12 inches in diameter, which was run by a motor connected with a storage battery. The whole affair being light and portable, proved very convenient in manipulation. A box was prepared about 20 inches in diameter, the bottom covered with a loose copper plate in connection with wires for attachment to the Holtz machine. In the box, suspended by a brass rod, was an insulated plate of dry wood covered with tin-foil, and with the under side filled with brass points, the whole affair made adjustable by sliding brass rods. Fume was let into the box by means of a three-inch opening in one end, and allowed to pass out by an opening in the opposite end, and by means of other boxes of larger size attached to the first one, any particles not caught in the first might be saved in the second box. The fume consisted of oxide and sulphide of zinc containing from 16 to 20 per cent of sulphide of lead, very light and free from all metallic substances and siliceous dust, and was taken at such a distance from the furnaces that it was perfectly cooled. There was no smoke present, but the fume moved in an atmosphere composed principally of sulphurous acid gas and the gaseous products of combustion from the furnaces.

The conditions seemed favorable, and the first application of the electric current from the Holtz machine caused instant collection of the fume into small snow-flake-like balls, which were alternately attracted and repelled when the fume was held inclosed in the box, or passed in showers into the outer boxes when the fume was allowed to pass somewhat rapidly through the boxes. The experiments were varied, and many other plans tried with the small machine; but no plan gave better results than the one described. One thing was always noted in these experiments: Complete precipitation could not be effected, even though the fume passed ever so slowly through the electrified box; there seemed always to be a portion that would not collect; yet analysis of that portion, easily collected, gave evidence that it differed in no way from the fume when wholly collected by passing through cotton bags. However, the success was deemed sufficient to warrant the trial of a larger machine, or one of sufficient size to work on a commercial scale. Accordingly, I had built a Holtz machine of modified form, containing 8 double plates 20 inches in diameter, the machine being run by power. This, when charged and run at 400 revolutions a minute, required about 1½ horse-power. It is perhaps needless to say that the amount of electricity generated was something enormous. Sparks received from it were young thunderbolts, and would nearly unjoint one's fingers. It was reasonable to suppose, in the light of the other experiments with the smaller machine, that this large one would give results at least equally good in proportion. First, a ring was made of 2-inch brass tube and covered with ½-inch copper netting studded with points. This ring was arranged at one end of a room, 60 by 42 feet, into which entered a 30-inch pipe conveying the gases and fumes from a blast-furnace. All the fume was made to pass through the electrified ring and thence over a metallic plate in a moderately slow current. When fully charged and in a dry atmosphere, a portion of the fume collected in flakes and slowly deposited on the floor of the room, but in a bulky and exceedingly light condition, so that the merest breath would disintegrate and blow the collected particles away. Various expedients were resorted to, and many schemes were tried, but in no case could more than a fractional part of the fume be collected. The electricity seemed abundant, but nevertheless no results approaching any thing like a commercial success were attained. All the experiments were tried under the direction of a skilled and competent electrician. It may be that the gases in the fume, or the composition of the fume itself, or the application of wrong principles, had something to do with our lack of success. Still, the undeniable fact stands out that we were comparatively successful when operating on the fume in closed spaces free from currents. The conclusion that we arrived at was, that the process, while interesting as an *experiment* in a small way, could never be made useful on a large commercial scale.

Even granting that the fume can be collected by means of the static current, it would be so bulky and require so much space that it could never compare with the bag process in economy.

A recent letter from Mr. Alfred O. Walker, of the Bagillt Lead-Works, England, although expressing hope, does not as yet intimate success in his experiments with electricity as an agent for depositing fume.

OTHER PROCESSES.

After trial of condensing-chambers, water-sprays, steam-jets, and wire netting, I am of the opinion that no process can begin in economy, cleanliness, and dispatch with the "bag process;" and I am also of the opinion that, when properly applied and better understood by smelters, it will leave little to be desired in the way of fume collection. I do not understand that the old-fashioned process of blowing fume through cotton or woolen bags, such as is now in use in zinc oxide works, is subject to any patents. The Lewis-Bartlett process is for the collection of special fume for lead paint, and as I have seen it at the Lone Elm Works, at Joplin, Mo., is quite different from the old zinc process. At all events, patents on the bag part would not hold, since it has been too long known, too long used, and too often described. Contrary to general opinion, the plant necessary for cooling and blowing fume through woolen bags is neither very expensive nor complicated; and after it is once in operation, is lasting and easily managed.

Prize for the Best Method of Preventing Blasting Accidents in Coal Mines.—The mining owners of Ostraw Rarwin have decided to offer a prize of 1000 ducats (about $2500) for the best invention for preventing accidents in the shooting and ballasting connected with coal-dust in mines, or rendering the operation harmless. The invention should answer to the following conditions, namely: 1st. Its use, effects, or explosion should not cause the coal-dust to ignite. 2d. It should not produce after the explosion or use more injurious gas than through the methods heretofore employed. 3d. No specially difficult, dangerous, long preliminary arrangements or complicated apparatus should be required in using, setting up, loading, transporting, or lighting. 4th. Should not by its use and result be much more expensive than the former blasting methods. All applications should contain full particulars, and also of practical tests already made, stating name and address of applicant, and be sent on or before the end of 1886 to the K. K. Berghauptmannschaft at Vienna. All projects, also the one which will be awarded the prize, will remain the property of the tender. From the Imperial Royal Ministry of Agriculture, Vienna.

BOOKS RECEIVED.

[In sending books for notice, will publishers, for their own sake and for that of book-buyers, give the retail price.]

A Treatise on Belts and Pulleys. Embracing Full Explanations of Fundamental Principles; Proper Disposition of Pulleys; Rules, Formulas, and Tables for Determining Widths of Leather and Vulcanized Rubber Belts and Belts Running over Covered Pulleys; Strength and Proportions of Pulleys, Drums, etc. Together with the Principles of and Necessary Rules for Rope-Gearing and Transmission of Power by Means of Metallic Cables. By J. Howard Cromwell, Ph.B., Author of a Treatise on Toothed Gearing. New York: John Wiley & Sons. 1885. 8vo, pages xv+271 (including Index) and 120 Figures. $2.

Mechanics and Faith. A Study of Spiritual Truth in Nature. By Charles Talbot Porter. New York and London: G. P. Putnam's Sons. The Knickerbocker Press. 1886. 12mo, pages x+295. $1.50.

Introductory; the Unseen; the Criterion of Truth; Superstition; the Judicial Spirit; the Unity of the Mind; Mechanical Science and Rationalism; Revelation; the Revelation of Objects of Sense; Coöperation; the Revelation of Mechanical Truth; the Revelation of Ideal Truth; Materialism; the Revelation of Force; the Unity of Physical and Spiritual Truth; the Perception of Spiritual Realities by Recognition; the Revelation of God; the Verbal Revelation; Perfection; Natural Religion; Beauty; Suffering; Faith; Prayer.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

The following is a list of the patents relating to mining, metallurgy, and kindred subjects, issued by the United States Patent-Office.

GRANTED MARCH 2D.

336,914. Apparatus for Ventilating Mines. Louis L. Graves and John Kangley, Streator, Ill.

336,941. Process of and Apparatus for Distilling Oil. James W. Norton and Franklin H. Rouse, Kinzua, Pa., Assignors of one third to Jacob C. Fuller, same place.

336,970. Amalgamator. Joseph Wilkins, Baltimore, Md.

337,000. Hydrocarbon-Engine. John P. Holland, Brooklyn, New York.

337,012. Gas-Regulator. John E. Miller, Pittsburg, Pa., Assignor of one half to Augustus H. Heisey, same place.

337,062. Fireless Steam-Engine. Moritz Honigmann, Aix-la-Chapelle, Germany.

337,085. Ore-Crusher. Samuel G. Rollins, Boston, Mass.

337,116. Electric Leak-Alarm for Pipes. Henry G. Bauman, Pittsburg, Pa., Assignor to himself and James T. McMaster, same place.

337,122. Machine for Concentrating Ores, etc. Francis H. Blake, Pinal, Ariz., Assignor to himself and Charles Espenschied, same place.

337,172. Mechanism for the Manufacture of Metal Wheels. James R. Little, Quincy, Ill., Assignor to the Quincy Metal Wheel Company, same place.

337,197. Apparatus for the Production of Pure Sulphurous Gas. François Randon, New Orleans, La., Assignor, by mesne assignments, of one half to Virginie M. T. Johnson, New York City.

337,230. Machine for Rolling Car-Wheels. Theodore W. Bean, Norristown, Pa.

337,246. Process of Purifying Coal-Gas and Obtaining Ammonia and other Products therefrom. Carl F. Claus, London, England.

337,279. Machine for Clearing Twist-Drills. James A. Morton, New Bedford, Mass., Assignor to the Morse Twist Drill and Machine Company, same place.

337,350. Gas-Supply Pipe. George Russell, McKeesport, Pa., Assignor of one half to Enoch H. Leizure, same place.

FURNACE, MILL, AND FACTORY.

The Edwards Iron Company, whose furnace at Woodstock, Ala., has been idle for some time, proposes to remodel the furnace this spring and make it yield about 20,000 tons yearly.

The De Bardeleben Steel Company has been organized with a capital of $1,000,000. The company proposes building two large blast-furnaces at Jonesboro', twelve miles south of Birmingham, Ala. A railroad will be built back nine miles into the red and brown hematite ore-fields, where large tracts of excellent ore are owned, and also into the great Warrior coal-fields, where extensive mines will be opened and a large number of coke-ovens built, thus giving it all the material required for making iron on its property, easy of access.

The failure of the Kemble Iron and Coal Company caused the suspension of operations at its works at Riddlesburg, in November, 1884, and one of the furnaces was then banked up. Last week, the furnace was opened for the first time, having been closed for nearly sixteen months. The fire was found still burning, the coke glowing brightly, and on the admission of air it soon became hot enough to melt cinder. It was as easy a matter to start the furnace as if it had been standing only a week.

The Alta Vista Iron and Steel Company, at East St. Louis, Ill., has been incorporated for the manufacture of iron and steel; capital stock, $100,000; incorporators, Charles Adams, Stanley F. Ballou, E. W. Curtis, and W. H. Garrett.

The blast-furnace at Frankstown, Pa., owned by the Cambria Iron Company, of Johnstown, has been leased for a term of five years by James Pierrepont, of Stormstown. The furnace has been idle for three years. It will be blown in as soon as the necessary repairs have been made. The furnace will be used to make a pig adapted to the manufacture of Clapp-Griffiths steel. It is understood that a Pittsburg firm has contracted to take all the iron turned out by the furnace at the current market price.

The blast-furnace of the Charter Rolling-Mill Company, Pa., which has been out of blast for the past eighteen months, has resumed operation.

The new sheet mill and new hot polished shafting-works of the Mahoning Valley Iron Company, at Youngstown, Ohio, will be ready for operation before the close of the month. The same firm is pushing the erection of the new nail and plate mill, anticipating an early settlement of the nail strike. If the strike is settled, it will start the nail mill as soon as completed.

The firm hitherto operating the Phœnix Fire-Brick Works—composed of Messrs. Seaman, Sleeth, Black, and Isaac Reese—has been dissolved, the first three retiring. Mr. Reese will continue the business, and his office will be at the works, Manorville, Armstrong County, Pa.

No. 2 blast-furnace of the Brooke Iron Company, Birdsboro', Pa., has just closed a successful blast of over four years. The stack will be relined and repaired as soon as possible. No. 3 furnace belonging to the same company will soon blow in.

At the Thomas Iron-Works at Hokendauqua, Pa., No. 6 furnace has been blown in, putting in operation six furnaces, for the first time, it is said, since 1880. The company has twelve furnaces, ten in blast, and two in course of repair, which will go into operation as soon as repaired.

The Antrim Furnace Company has been organized at Grand Rapids, Mich., to operate the old Otis furnace at Mancelena. The capital stock is $100,000; paid in, $50,000. The general offices will be at Grand Rapids. The officers are: President, T. J. O'Brien; Vice-President, J. M. Barnett; Secretary and Treasurer, J. C. Holt; General Manager, Edward Fitzgerald.

The St. Louis branch of the Henry R. Worthington Hydraulic Works sold last week a 750,000-gallon compound steam-pump, together with boiler feed-pump and fittings to be used at a zinc mine near Webb City. Included in the deliveries of the week was a large elevator pump, with 16-inch steam-cylinders and 12-inch water-plungers.

A contract has been made with the Delamater Iron-Works of this city, whereby the company is granted exclusive right to build marine boilers for the port of New York under the Heine patents.

The Heine Safety Boiler Company, of St. Louis, Mo., has sold a 250 horse-power Heine boiler to Schoenberger & Co., of Pittsburg, Pa.

The new charcoal furnace at Iron River, Mich., is working satisfactorily, producing about 40 tons, with the prospect of increasing it to 60 tons. The company is making the patterns for casting some 1200 plates for building portable iron kilns, according to the patent of W. A. Lovelace, who will superintend their construction.

The Harlem River Bridge Commissioners, of this city, have finally decided upon a structure of steel and iron, which is to cost not more than $1,500,000.

F. A. Pascoe is constructing a paper water-tank of 2000 gallons capacity, for the Deseret Woolen Mills, Utah. It will be samething of a novelty.

Official advices report that the Alta Vesta Iron and Steel Company, of East St. Louis, Ill., capital, $100,000, incorporated March 4th, 1886, has purchased the old Peckham Iron-Works, and will begin operations about May 1st. It proposes to manufacture iron and steel directly from the ore under the patent (No. 310,164) granted to Mr. Charles Adams, of Alleghany City, Pa., January, 1885. Mr. Adams is largely interested.

Our St. Louis correspondent informs us that the Vulcan Steel-Works are closed down, owing to a strike. The Bremen Works are only working 10 puddling-furnaces. The Helmbacher Forge and Rolling-Mill is only running about half-time, and is using but one furnace and two steam-hammers. The McDonald Forge is only running half-time.

PROPOSALS.

The Board of County Commissioners of Stearns County will receive proposals until March 18th for iron highway bridge, 144 feet span, across Clear Water River, at Clear Water, Minn., similar bridge across Sauk River, in Grove, Stearns County, and bridge of same length across Crow River, at Paynesville.

Major G. J. Lydecker, United States Engineers, Office of Engineer Commissioner, Washington, D. C., will receive proposals until March 23d for furnishing 15,000 lineal feet of 6-inch cast-iron water-pipe, 30 6-inch 4-way water-gates and boxes, and 10 6-inch 2-way water-gates and boxes.

The United States Engineer Office, Charleston, West Va., will receive proposals until April 1st for the iron-work of the weir, etc., of a movable dam on the Great Kanawha River, West Va.

LABOR AND WAGES.

The wages of the employés on the Colorado Central mine at Georgetown, Colo., were reduced on the 3d inst. from $3 to $2.60 a day. The Colorado United Mining Company, at the same place, has been paying $2.50 a day for some time past.

The Grand Jury at Uniontown, Pa., has ignored the bills against the striking cokers in jail charged with causing a riot and burning property at Broadford belonging to Frick & Co. The prosecutor, B. F. May, who represents Frick & Co., was sentenced to pay the costs.

It is reported that the miners at the Marshall Coal Company, at Erie, Colo., have struck on account of the company having reduced wages from $1.22 a ton to 92 cents.

At the convention of coal miners and mine operators at St. Joseph, Mo., last week, a permanent organization was perfected, which will form a part of the National Coal Miners' Federation. Mine operators as well as miners will be permitted to go in the organization, whose object it is to prevent strikes and to establish a uniform scale of prices that will be fair to all parties.

The differences between the Granite Cutters' Union and the Rhode Island Granite-Works at Westerly, R. I., which have existed for more than a year, have been settled.

The working of convicts at some of the mines in Kentucky has been the cause of trouble at the Greenwood mines in Pulaski County, and several companies of State militia have been sent to the mines to protect the convicts and the property. Reports dated the 8th inst. state that the free miners have promised not to molest the convicts for two weeks, stating that they would give the Legislature that time to pass laws removing the convicts from the mines.

A meeting of the Western Nail Association was held at Cincinnati, Ohio, on the 10th inst., and resolutions were adopted, affirming its adherence to the manufacturers' scale as fair and equitable to the workmen and essential to the success of the nail business of the West, and renewing its assurances to the workmen now working or who may hereafter work under the manufacturers' scale that they shall retain their positions undisturbed by either compromises or combinations.

An extensive strike of the coal miners of District No. 3 of the National Federation of Miners and Mine Laborers, comprising the soft coal districts of the East, was inaugurated on the 8th for the uniform scale which was adopted at the convention at Cumberland on February 19th. The scale is: Irwin, 60 cents; Clearfield, 50 cents; Meyersdale and Garrett, 40 cents; Pocahontas, 75 cents; Elk Garden and George's Creek, 50 cents, involving a general advance of 10 cents a ton.

According to a promise made last September, the Troy Iron and Steel Company has notified its employés that wages will be advanced, to date from March 1st. The wages of the puddlers will be raised 50 cents a ton. The wages of all other mechanics are raised 10 per cent.

The 250 employés of McIntosh, Hemphill & Co., foundrymen at Pittsburg, Pa., have been notified of an advance in their wages of from 5 to 15 per cent, to take effect April 5th.

TRANSPORTATION NOTES.

Arrangements are making for the construction of the first seventy-five miles of the Arizona Mineral Belt Railroad, which will run through some of the mineral regions of Arizona.

The Pennsylvania Railroad Company has taken out articles of association for a car trust company to be known as the Pennsylvania Equipment Company. Money will be borrowed at the rate of 4 per cent under the trust to the extent of $10,000,000. One thousand eight-wheel coal cars have been ordered to be built.

Representatives of the roads that formed the Pacific Coast Association held an informal meeting at Chicago, Ill., this week, and decided to make rates on all classes of freight 40 cents for car-loads and 50 cents for less than car-loads. The ruling figures have been a uniform 50 per cent off from the old tariff.

The annual meeting of stockholders of the Pennsylvania Railroad Company was held in Philadelphia, March 9th. The annual report was read and commented on, President Roberts answering such questions as were propounded to him, but the only information elicited was that the Adams Express Company's freight was not carried at or near the price of pig-iron, and that the surplus assets could not be distributed among the shareholders unless the company sold its effects and went out of business. A resolution was adopted authorizing the directors of the company to issue from time to time 300,000 shares of capital stock of the company, the said shares to be issued, apportioned, and disposed of as the directors shall decree for the best interests of the company. A resolution directing the incoming managers to enter into negotiations with the Central Transportation Company looking to acquiring the right and property of said company to the end that the profits from running sleeping and parlor cars may accrue to the shareholders of the Pennsylvania Railroad Company, was referred to the incoming board. Resolutions instructing the managers to conduct the express and telegraph business instead of depending on other companies were laid on the table. After the adoption of a resolution instructing the chairman to appoint a committee of seven to name a new board of directors, the meeting adjourned.

General Freight Agent Hannaford, of the Northern Pacific Railroad, made a big cut in freight rates to Portland, Oregon, on the 11th inst. Freight can now be shipped from Chicago to Portland for 65 cents per 100 pounds, regardless of classification. The cut was inaugurated by the Southern roads, and in order to protect Portland customers, the Northern Pacific was obliged to follow suit. This was done to prevent Portland merchants from shipping to San Francisco and thence by steamer to Portland. The rate from St. Paul to Portland is 60 cents, 5 cents less than from Chicago. The Northern Pacific contracts with Portland roads from Chicago to St. Paul, by which the Chicago roads get 15 per cent of the through rate. The Chicago roads are therefore compelled to send by the Northern Pacific in this fight, and thus get not quite 10 cents per 100 pounds on the through freight for the haul from Chicago to St. Paul. This cut is the greatest ever known for such long hauls.

COAL TRADE NOTES.

ALABAMA.

The Montevallo Coal and Transportation Company, Aldrich, will hold a meeting April 5th, to consider the question of increasing the capital stock from $100,000 to $300,000, for the purpose of enlarging the property and plant.

COLORADO.

The statement telegraphed from New York a few days since, to the effect that the Colorado Coal and Iron Company holds a claim of $87,000 against the Denver & Western is a mistake. The claim is not against the Denver & Rio Grande Western, which was generally inferred from the dispatch, but against the Denver & Rio Grande.

ILLINOIS.

The Grant Coal Company, of St. Clair County, has put in a Legg machine, and is cutting about 100 feet face and 5 feet undercut a day.

IOWA.

The Moingona Coal Company, of Moingona, has established a branch office at Rapid City, Dakota.

MISSOURI.

The Pleasant Hill Mining Company has found good paying coal at a depth of 300 feet, and at a depth of 860 feet another vein 2 feet thick. It is considered as first-class bituminous coal. The drilling will be continued. The air-shaft of the Dutch Hollow mine, which recently caved in, is now in order again.

MONTANA.

The Butte Gas-Light and Coke Company has been using Bozeman coal, purchased from the Northern Pacific, but it has not proved entirely satisfactory, owing to its small gas production, and the presence of a large quantity of sulphur. It is stated that the Rock Springs coal can not be used for gas production at all, and the company has lately made arrangements to obtain Crested Butte and Pleasant Valley coal, which, mixed, will make about 6 feet of excellent gas to the pound.

PENNSYLVANIA.

ANTHRACITE.

THE PENNSYLVANIA COAL-FIELDS.—Mine Inspector Williams, of the Middle District coal-field, filed his annual report on Monday, showing the amount of coal mined and shipped for 1885 at the various collieries in his district. The average number of working days was 194. During the year 19,073 persons were employed, of whom 178 were injured and 89 killed. The total coal product was 6,177,644 tons, against 7,881,955 tons in 1884. Twenty-one collieries, however, have been set off from this district, and now constitute another district. In 1884, these collieries mined 2,146,563 tons. Allowing for this reduction, the output for the Middle District in 1885 was 442,222 tons over that of 1884.

Another largely attended miners' meeting was held at Nanticoke on the 9th inst., to hear the report of the committee of conference with the officials of the Susquehanna Coal Company relative to continuing the work of recovering the entombed miners. The committee presented a written answer from General Manager Stearns, which said: "Before giving a final answer, we would respectfully suggest that a committee of eight or ten of the oldest and most experienced miners in the employ of the company be appointed by the employés of the company to confer with its officials for the purpose of discussing the question of the safety and the practicability of continuing the work of rescuing the bodies of the men and boys buried in No. 1 slope." The meeting accepted the report and adopted resolutions instructing the miners and laborers of each shaft and slope to select two miners to serve on the committee.

A large shaft in the pumping machinery at the Reliance Colliery, Philadelphia & Reading Coal and Iron Company operators, broke on the 6th inst., and on the 8th inst. the mine was flooded. Considerable time will be required to put the mine in working condition.

J. I. Hollenbeck, of Audenried, and L. K. Hannum, of Pottsville, are negotiating for a lease of the colliery recently operated by Schwenk, Robertson & Co., at Mount Carmel. A new slope will be sunk, the breaker will be enlarged and improved, and the mine given a shipping capacity of fifty cars a day.

BITUMINOUS.

The Barclay Coal Company reports its income from rent of railroad and royalty on coal for the month of February, $6326.

A terrible explosion of fire-damp occurred at noon on the 8th inst., in the Uniondale mines, near Dunbar, by which several men were killed and a number of others injured. Mine Inspector Davis is making investigation, and the coroner has impaneled a jury. The miners in the Morrell, Wheeler, Colvin, Atlas, and Anchor pits have been ordered out by the Mine Inspector, until the mines are cleared of the dangerous gas. The last mine disaster of this kind in this region occurred at the Youngstown mine, near Uniontown, in October, 1884, when fourteen people were killed. In February of the same year, nineteen men were killed by a fire-damp explosion in Leisining mine, near here.

GAS AND OIL NOTES.

Exports of refined, crude, and naphtha from the following ports, from January 1st to March 6th:

	1886. Gallons.	1885. Gallons.
From Boston	568,636	1,043,709
Philadelphia	16,445,258	11,889,171
Baltimore	1,948,800	1,854,356
Perth Amboy	718,086	
New York	67,894,155	61,512,379
Total exports	77,528,737	76,299,615

The Chief of the Bureau of Statistics reports the total values of the exports of mineral oils from the United States for the month of February, 1886, and during the eight months ended February 28th, 1886, as compared with similar exports during the corresponding periods of the preceding year, as follows: February, 1886, $3,259,461; February, 1885, $2,975,991; eight months ended February 28th, 1886, $33,725,129; eight months ended February 28th, 1885, $33,670,009.

COLORADO.

The new well of the Arkansas Valley Company, at Florence, Tremont County, produces thirty barrels daily. The refinery is running on full-time and is producing a series of lubricants unequaled, and it is stated that the illuminating oil is vastly superior to the best brands offered in the Denver market. Fremont County oil is in general use in Cañon City and is meeting with hearty indorsements throughout the State.

DAKOTA.

The Central Oil Company will thoroughly test its extensive property on Oil Creek, and has purchased a machine that has a capacity of boring one thousand feet.

NEW YORK.

The commission appointed by the Mayor of Buffalo to investigate the subject of natural gas has presented its report, which recommends restrictions that require gas companies to furnish satisfactory proof that they are able to supply a sufficient quantity of gas to warrant the issuance of the grant, and that they should be compelled to repair and repave all such streets as they tear up, keep them in good condition for two years, and indemnify the city from all loss, expense, or damage. The committee recommends that the Common Council shall establish a maximum rate, and that the companies shall furnish the city with gas at a discount on schedule rates. To the city is reserved the right to buy the plant after the expiration of a certain number of years.

PENNSYLVANIA.

Charters have been granted to the Washington Natural Gas Company, with $500,000 capital. The company will supply Pittsburg and Alleghany City with gas from Washington County to the Westmoreland & Cambria Natural Gas Company, with $250,000 capital. The company will supply Johnstown and other places with natural gas, and the Bellewood & Monongahela City Natural Gas Company, of Monongahela City; capital, $10,000.

Two new gas wells were added last week to the Murrysville producers, one belonging to the Philadelphia Company and the other to the Chartiers Company. They are in close proximity to each other, and both reported to be equal to the best in the district.

The fight between the Pennsylvania Natural Gas Company, of Warren, and the Columbia Gas Company, of Franklin, for admittance to Erie City with their pipes, has been settled in the City Councils. Ordinances passed admitting both companies on equal terms. Both companies will now start for Erie with their pipes—the Columbia from Franklin, sixty miles, and the Pennsylvania from the Warren and Ludlow field, ninety miles.

It is reported that a large oil strike was made on the 12th inst., a quarter of a mile north of the celebrated Smith well. The oil comes from a hitherto unproductive sand at 1445 feet. The well gases strongly, and makes flows of three minutes' duration at intervals of 15 minutes, throwing a solid column of oil far over the top of the derrick.

GENERAL MINING NEWS.

ALASKA.

From a letter written to the Marquette *Mining Journal* by Governor Swineford, while on his way to Prince of Wales Island, we take the following:

On Whitney Island, Cleveland Passage, and off Cape Fanshaw, on the mainland, I found a very large bed of slate, apparently of the finest quality, and very similar in color to that of the Huron Bay quarries. I found a similar quality of slate cropping out on the shore of Wrangel Narrows, and am told that very large bodies of it are known to exist in various other sections of the territory. On Prince of Wales Island, the Hydah Indians use a slate exactly like the soft quality found on Silver River, near L'Anse, for "totems," which they carve in every style of native art, and also for making elaborately carved stone boxes, of which there are but two pieces—the box proper and the lid. It carves easily, takes a fine polish, and some of the carvings made from it are really very fine. At several places on Admiralty, Baranoff, and Prince of Wales islands, very fine qualities of marble have been discovered; but as yet no well-directed effort has been made toward the opening of a quarry. The beds afford evidence of their very large extent, and being contiguous to tide-water, the question of their development is one of time only. On Prince of Wales Island, near Shakan, there is a very large quartz vein carrying pyrites, with some silver, but whether there is enough of the latter to pay is a question yet to be determined. Here and there throughout the territory, I hear of small parties that have been working placer claims during the past summer, with varying results, and from every direction come reports of quartz lodes, said to be rich, but the value of which remains to be proved. I have seen and heard enough to convince me, however, that the natural wealth of this unappreciated, long neglected national possession is beyond computation, even if we do not embrace in the calculation the fact that it is certainly, beyond the contingency of a doubt, the coming great gold-producing field of the world.

ARIZONA.

The Arizona papers have information from Washington, it is stated, that the county courts, created by the Thirteenth Territorial Legislature, will probably be declared unconstitutional by the Supreme Court of the United States, and all the important decisions that have been rendered by these courts consequently null and void. Some of the latter embrace mining controversies in which Eastern shareholders are concerned; for example, that recently described in these columns as going on between the Copper Prince and Copper Queen companies of Bisbee.

SANTA RITA LAND AND MINING COMPANY.—The new lease of the mines of this company dates from March 1st, 1886, and is for one year, with optional continuance. The terms give the company 20 per cent of the gross product delivered at the smelter, and are favorable in that they provide for a development of the company's claims without cost to itself, save in two mines where little outlay need be made. Two of the mines have a common shaft. This is to be sunk 50 feet during the year. The shafts on six other claims are to be sunk each 10 feet.

GILA COUNTY.

OLD DOMINION.—The company's property, consisting of mines, furnaces, and machinery, was sold by the sheriff, at public auction, at Globe, February 20th, for $130,000, to William Keyser, of Baltimore, Maryland. The sale was made under execution of a judgment of $277,388 to Messrs. Pope, Cole & Co., of Baltimore.

CALIFORNIA.

INYO COUNTY.

LOOKOUT.—The ore-body recently struck is opening up. The daily output is nine tons, which can be increased to twenty tons. Three car-loads of high-grade lead ore are to be shipped to San Francisco, to be tested and to determine which is the most profitable way to dispose of it. All of the ore hitherto taken from the mine has been smelted at Lookout, but the ore of this recent strike has been much richer than any found in

the mine. The wages of outside men have been reduced to $3.50 a day.

MONO COUNTY—BODIE DISTRICT.

Reports for the week ended February 28th:

BULWER CONSOLIDATED.—During the week, the work in the mine has been principally confined to the 350-foot or tunnel level. The ledge in the drift is 3 feet wide, and carries 16 inches of low-grade ore. The ore-streak has improved both in size and quality, with promise of making a body of milling ore.

MONO.—There were shipped to the Bodie mill during the week 151 tons of ore, and to San Francisco, $18,624.86.

STANDARD.—Bullion shipment made on the 23d was valued at $8907.33. There were sent to the mill during the week 320 tons of ore. The mine is looking well and the mill is running steadily.

SAN BERNARDINO COUNTY.

The suits of A. L. Waterman against R. W. Waterman and J. L. Porter to recover twenty-seven one hundredths of the Alpha, Omega, Silver Glen, and Front mines was decided in the Circuit Court at San Francisco on the 2d inst. in favor of the complainant.

CANADA.

PROVINCE OF NOVA SCOTIA.

The following official returns for the month of January are given by the Halifax *Critic*:

	Tons.	Oz.
Salmon River—Dufferin Mining Co.	947	1297
" " Old Mulgrave lode	28	49·14
" " Other mines	19	17·18
Waverley—C. F. McClure	45	24·18
Luke Catcha—Oxford Gold Mining Co.	56	67·10
Rawdon	84	155·0

CENTRAL AMERICA.

LA UNION.—The extensive works of this mine of Costa Rica have been fitted up with the Duncan concentrators, made by the Pacific Iron-Works, Rankin, Brayton & Co., San Francisco, Cal. The machines are making a most important saving in the working of the ores.

COLORADO.

CLEAR CREEK COUNTY.

HAYDEN.—The property of this company, including the Gold Bug, Gold Crown, and H. B. lodes, were sold by the sheriff last week to satisfy a claim of Hal Sayr and Samuel A. Rank.

MARK TWAIN CONSOLIDATED.—A 50-ton concentrating mill is to be built in the spring. Morris & Vincent, ore buyers, will build a sampling-mill and open an ore-purchasing agency at Montezuma.

METROPOLITAN AND KANGAROO.—The sheriff sold at public auction, at Idaho Springs, a tenth interest in the Metropolitan lode, and a tenth interest in the Kangaroo lode, both located on Seaton Mountain, for $1120. The sale was made to close up the estate of Mr. Peter G. Gustavison, deceased.

NEATH.—Reports state that John Dumont has sold this mine, near Empire, for $125,000.

PLUTUS.—The works are running day and night, and treating over 600 tons a month of the company's own ore.

GUNNISON COUNTY.

The marble from the quarries at Crystal is said to be of most excellent quality, fine grain, and pure snow white.

LAKE COUNTY.

The Leadville *Herald-Democrat* reports the following: There are at present sixteen large argentiferous lead smelting-furnaces in blast, with prospects of several more being blown in shortly.

BAILEY CONCENTRATOR.—Bailey Brothers, who built a small concentrating mill in Stray Horse Gulch some months ago, appear to be doing good and economical work. They are running on low-grade stuff from the Evening Star mine, which they improve and make into a product ranging in value from $35 to $60 a ton. The equipments of their mill consist of three jigs and a trommel for sizing the ore. The whole is operated by a small horizontal engine and a diminutive upright boiler. The ore treated is screened at the mine, and only such material as is small enough to jig is brought to the mill. The mill turns out from three to four tons of concentrates a day. The water for the mill is obtained from the Wolfe Tone shaft, the pumps in which throw enough water for a dozen jigs.

BLIND TOM.—The lessees have abandoned operations. The ore-pocket yielding so largely in the past has about been exhausted.

DENVER CITY AND LEE BASIN VS. WARD CONSOLIDATED.—The contest between the Denver City and Lee Basin mining companies against the Ward Consolidated Company, for the territory conflicting between the Shamus O'Brien and Olive Branch lodes, promises to be settled soon. Suits in ejectment were brought in the District Court on the 4th inst. against the Ward Company.

HUMBOLDT.—This mine on the north side of Iron Hill produced about 100 tons of ore last month. The mineral averaged thirty per cent in lead and seven ounces in silver.

LEO.—The ore encountered in this shaft, sunk near Oro City, runs from half an ounce to two ounces in gold to the ton.

MANVILLE.—A third furnace is erecting at this smelter, in Big Evans Gulch.

MORNING STAR.—The mine is shipping a fair quantity of lead ore, and also a great mass of iron. The shipments of iron ore on a large scale have only been renewed in the past few days. A contract has been made with the Omaha & Grant smelter at Denver for 6000 tons of ore, to be delivered during the next six months.

NEW PITTSBURG LEASE COMPANY.—The company has decided upon the sinking of a deep shaft for the thorough exploration of the New Pittsburg territory. The Pittsburg Lease Company will be incorporated with 100,000 shares, of $1 each. These shares will be allotted to present shareholders of the New Pittsburg Company, one share for every two of their present stock. The new shares will be assessable, with calls of probably five cents a share a month, until their par value is paid in. Arrangements have been perfected with the bondholders to continue their bonds and to pay the interest on them out of the royalties redounding to the company from the operations of the new organization.

LA PLATA COUNTY.

SAN JUAN & NEW YORK.—This company's smelter at Durango is running one furnace and three roasters, and making between three and four cars of bullion a week, with a prospect that this will be doubled by May 1st.

MONTROSE COUNTY.

A small boom is in progress in the Portland Mining District, near Montrose, owing to reported rich strikes, and many claims are vigorously worked.

PITKIN COUNTY.

DURANT VS. CONNEMARA.—The owners of the Durant, an apex claim, brought suit in the United States courts on the 2d inst. against the owners of the Connemara, a mine which lies beneath the Durant on the side of Aspen Mountain.

KEYSTONE.—According to the Pitkin *Sun*, the lessees on the west end of this mine on Aspen Mountain, at a depth of 140 feet struck an 8-inch streak of coal. Two analyses were made; one of them makes it 81 and the other 82 per cent pure. The coal was encountered under 20 feet of shale. Several other properties—one, the Vallejo—have had similar finds, but they soon worked out and were never considered of any importance.

PUEBLO COUNTY.

MASSACHUSETTS.—This smelter at Pueblo has not been sold to Chanute & Holden at Leadville as reported. They made an offer to lease it, but not to purchase, and it was refused by the manager.

SAN JUAN COUNTY.

Arrangements are making by the Mears Transportation Company, at Silverton, for increased facilities to handle the increasing ore production.

GENESEE.—A strike has been made in this mine in Red Mountain District.

SAN MIGUEL COUNTY.

FLORA.—This company has stopped work on the cross-cut tunnel for the development of the Flora mine. A third level has been started at 150 feet depth with most encouraging prospects. At least a thousand tons of ore on the dumps of this mine will be shipped down to the Bassick and Wann mills when packing operations are resumed.

SUMMIT COUNTY.

BEAR MOUNTAIN.—This company continues to push its 1500-foot tunnel. The property is worked with Ingersoll air-drills. The object of the tunnel is to cut the vein of the Hudson River lode, which is higher up the hill, and will not only facilitate the working of the mine but also serve as a drain.

BEN BUTLER.—A new hoisting and pumping plant will be erected at this mine, which has recently disclosed large bodies of ore, and an increased output will begin.

GOLD DUST.—Trouble has occurred between the different owners, and recently two of them, armed with rifles, drove off the men who held a lease from the other owners. The difficulties were not settled as lately as February 27th.

HUB.—Work has been resumed on this mine, and shipments will at once begin, as there is a large body of ore already exposed and ready for stoping. The ore is carbonates, and runs about 70 per cent in lead.

I. X. L.—S. C. Whipple, of Breckenridge, has been appointed superintendent of this mine at Swan, and is engaged in placing the machinery and the mine in condition to be worked.

ROBINSON CONSOLIDATED.—In eleven months ended January 31st, this company shipped 5730 tons of mineral, averaging 57 ounces of silver. The total receipts for the same were $214,415, and the company's royalty $72,775. Other income swelled the amount to $73,143. Current expenses were $42,420; dividend payments, $10,000; and treasury balance, $20,723.

SMALL HOPES.—The shaft has cut the vein for which it was sunk. The vein was first discovered in the tunnel, but the pitch of the vein being about ninety degrees, the shaft was sunk to allow the vein to be better developed as well as worked to a greater advantage.

DAKOTA.

LAWRENCE COUNTY.

CALEDONIA.—The official report, dated March 1st, shows that the ore produced from the 425-foot level was 1004 tons and from the cave 406 tons; total, 1410 tons. The drift on the 300-foot level is finished, and they are now cutting out at the face of this drift, so as to give a good opportunity to get at the caved ore. The winze advanced 6 feet; total depth, 57 feet. The south drift advanced 6 feet; total, 61 feet.

FATHER DE SMET.—The ore extracted from the first, second, and third levels, 2050 tons. East cross-cut, third level, advanced 15 feet on company account. Total length, 77 feet.

IRON HILL.—The bullion production for February was 28,000 ounces of silver, averaging 992 fine.

LIBERTY.—The company has ordered from Fraser & Chalmers an engine and hoisting-works. The main shaft on the Liberty lode is down 150 feet, and in good ore. There is also a fifty-foot shaft on the line between the Dakota and Mars lodes from which good prospects are obtained, and which will be lowered another hundred feet.

RIALTO.—At a meeting held March 1st, 40,000 shares of the capital stock of said company were authorized to be sold at 5 cents a share. The money obtained from the sale of stock will be used for developing purposes.

PENNINGTON COUNTY.

FAIRVIEW.—It is stated that this mine is to developed and machinery erected.

IDAHO.

For February, 1886, the shipments of ore from Hailey amounted to 1,014,200 pounds, being an excess of 110,000 or more over the shipments for February, 1885.

VIENNA.—The company's mill is at work on a 500-ton lot of ore for the owners of the Lion mining claim. The price agreed on for the milling is stated at $27 a ton.

MEXICO.

REAL DEL MONTE.—It is reported that this company may stop operations on account of the new taxation regulations being enforced in the State of Hidalgo.

MICHIGAN.

COPPER MINES.

The February products of mineral, varying from 70 to 83 per cent copper of the reporting mines of the Lake Superior District as compared with the outputs of the same mines for the corresponding month of the two preceding years is as follows:

	February.		
	1886.	1885.	1784.
	Tons.	Tons.	Tons.
Calumet & Hecla	2,269	2,081	1,989
Franklin	204	183	175
Quincy	201	180	200
Atlantic	188	186	172
Huron	120	112	76
Copper Falls	81	60	36

Total for the years mentioned to February 28th:

Mines.	Jan. 1 to Feb. 28. 1886. Tons.	Jan. 1 to Feb. 28. 1885. Tons.	Jan. 1 to Feb. 28. 1884. Tons.
Calumet & Hecla	4,733	4,570	3,908
Franklin	408	353	351
Atlantic	388	385	336
Quincy	376	341	380
Huron	247	231	148
Copper Falls	156	124	94

ARNOLD.—According to the Boston *Herald*, some $30,000 more or less, were expended in prospecting or developing it several years since. The property, comprising nearly 900 acres of mineral land, is situated in Keweenaw County, Mich., between the Petherick or Ash-Bed and Humboldt mines, which form its boundaries on the east and west sides, respectively. Like the Petherick, it formerly contained a part of the extensive tract belonging to the Copper Falls Mining Company. The prospective value of the Arnold lies in its possession of such an extent of "ash-bed," which crosses the entire property from east to west for more than a mile, and which has been opened and mined extensively in past years upon the Copper Falls and Petherick, and to a less extent upon the Humboldt; and also, in the strong probability of the discovery of fissure-veins and other belts of the formation, carrying mass copper—such as have been found and worked upon the two properties of which it was formerly a part. The Arnold, like the neighboring mines, is upon a hill, and so situated as to be worked by tunnels instead of by shafts, thereby greatly reducing the cost of mining. It is well supplied with water.

HURON.—If this company succeeds in selling its spring to the town of Houghton for $5000, the company's debt will, possibly, be no larger than it was last year. The operations during the first part of 1885 are reported not to have been very successful. A profit of about $4000 was made during the last two months of the year. The condition of the mine is favorable, and the monthly product now averages about 120 tons.

PENINSULA.—Nothing will be done until the sale of 400 acres of wood and timber land has been consummated, the intention being to avoid an assessment, if possible, to resume working of the mine. A special meeting for this purpose will be held April 1st.

IRON MINES.

IRON RIVER.—The royalty matters at this mine have been at last satisfactorily adjusted, and the company began work the first of this month, both at the north end of the vein and in the Isabella pit. It is putting up a new shaft-house and doing other work preparatory to a good season's shipping.

LAKE ANTOINE.—Work is prosecuted under considerable difficulty. The shaft has reached a depth of 50 feet, is in quicksand, and is very wet.

TRADERS'.—The ore produced assays about 58 in metallic iron, but very low in phosphorus. The company has already effected a sale of all the ore that can be produced the coming season. At a meeting of the company, it was decided to equip the mine with the necessary machinery for present purposes.

WEST CHAPIN.—Recent developments are of an encouraging character. The vein has been struck in the drift north from the new shaft, and a good quality of red ore encountered.

MONTANA.

LEWIS & CLARKE COUNTY.

BOSTON & MONTANA.—The statement for February shows the bullion production to have been $67,336; expenses, $28,301; profit for the month, $39,035.

RELIEF MINING COMPANY.—This company has been incorporated with a capital of $750,000, shares $5 each, to develop and work the Relief lode, a silver mine situated near the Elkhorn and yielding the same character of ore found in that mine.

SILVER BOW COUNTY.

PYRENEES.—A syndicate of Butte capitalists has purchased this mine for $30,000. The purchasers havincorporated a company that is capitalized at $500,000, having 100,000 shares at the par value of $5 a share. It is the intention of the new company to proceed with developments on an extensive scale.

NEVADA.

STOREY COUNTY—COMSTOCK LODE.

From the Virginia City *Chronicle*, we take the following:

The pay-rolls of the Comstock mines for February aggregate $137,478.

BEST & BELCHER AND GOULD & CURRY.—Connection was made on the 4th inst. with the third line of pumps below the Sutro tunnel level in the Osbiston shaft. This line of the main pump is 2168 feet below the surface, corresponding with the 2300 level of the Bonner shaft. Less than 200 feet of water remain in the shaft, which will be rapidly drained to the bottom, or 2319 level, corresponding with the 2500 at the Curry.

CONSOLIDATED CALIFORNIA & VIRGINIA.—During the week ended the 27th ult., 1046 tons of ore were shipped to the Morgan mill and 1661 tons to the Eureka mill. The average value of ore milled during the same period, according to assays from battery samples, was $14.87 a ton for that crushed at the Morgan mill, and $16.85 a ton for that crushed at the Eureka mill. The northwest drift on the 1650 level is rapidly nearing the old stopes in the extreme north end of the mine. Numerous stringers and bunches of ore have been cut in the last few feet advanced, indicating that the vein is close at hand. The west drift on the 1950 level is opening up and repairing, for the purpose of exploring a body of mineralized quartz lying southwest of the C. & C. shaft.

HALE & NORCROSS.—The station on the 3200 level of the deep winze in the Hale & Norcross mine is completed and an opening chambered out for a southeast drift to connect with the Combination shaft. They are now stoping out ore from above cross-cut No. 3 on the 3100 level.

KEYES.—Parties are quietly buying up liens filed on this mine. In several cases, labor liens have been purchased for 75 cents on the dollar. This movement is said to be in the interest of a capitalist anxious to secure control of the property.

NEW MEXICO.

SIERRA COUNTY.

KEYSTONE & TEMPLAR.—These mines at Kingston have been bonded for $65,000 to Vincent Wallace and Walter C. Hadley.

LADY FRANKLIN.—Negotiations for a sale of this mine at Kingston for $1,500,000 (?) are reported. The property is said to have been bought for New York parties. This is the largest mining sale that has taken place in Southwestern New Mexico for some time. This mine is said to be a valuable one.

SIERRA GRANDE.—The new mill at Lake Valley has been accepted, and received by the company. Everything worked according to contract.

NEW YORK.

PEARL SALT COMPANY.—This company has been incorporated under the laws of this State, to manufacture salt at Pearl Creek, on the Rochester & Pittsburg Railroad. The capital stock is $40,000.

NORTH CAROLINA.

MONTGOMERY COUNTY.

STEELE.—The stamp-mill now in course of construction it is thought will be ready to begin operations April 1st.

APPALACHIAN.—The company has provided for the erection of a forty-stamp mill.

TENNESSEE.

SHOAL CREEK IRON COMPANY.—This company has been organized at Columbia, with a capital stock of $150,000. Two thousand acres of iron ore lands owned by the company will be developed, and an iron furnace will be erected either at Columbia or in Lawrence County.

UTAH.

SALT LAKE COUNTY.

The receipts of bullion in Salt Lake City for the first two months of the present year, excluding all ores, aggregated $784,876 69.

CONKLIN SAMPLING-WORKS.—This company has been incorporated to succeed J. C. Conklin & Co., of Salt Lake City, to buy, sell, and sample ores and bullion. The capital stock is $22,000, divided into 2200 shares; the stock is fully paid up, and is unassessable, and the private property of the stockholders shall not be liable for the company's obligations. Twenty-five years is named as the corporate existence, with the principal office and place of business located at Salt Lake City. The company will operate the old Utah ore sampling-mill near the Utah Central depot.

SUMMIT COUNTY.

CRESCENT.—The capacity of the concentrator has been doubled, the old machinery repaired or replaced by new, and every thing is ready for active operations.

DALY.—The ore sales for January and February amounted to $60,117.26. The Marsac mill, at Park City, which is operated by the company, is working most satisfactorily. It is a complete thirty-stamp silver mill, combining the most modern machinery and appliances. It has been gradually working up in capacity ever since starting last month, and has reached fifty-three tons of ore a day crushed and discharged through the thirty-mesh screens. It is stated that the bullion produced is running about 980 fine in silver. The mill employs fifty-four men.

WASHINGTON COUNTY.

The new leaching-works at Silver Reef are getting into position to begin active operations. Several tons of mill tailings have been run through as an experiment, giving results highly satisfactory. As soon as the rolls and rock-breaker are placed in position, the company will be ready to crush custom ores. In the mean time, they will work mill tailings, of which they have between 15,000 and 20,000 tons on hand.

CHRISTY.—A station is cutting on the 600-foot level, in the California, preparatory to sinking the working winze 100 feet deeper. The second level in the Maggie and the stopes in the third California have been connected. Connections have been made with the lower stopes in the new shaft, and ore is extracted from these stopes as well as in those in the uprise. The mine is producing an average of seventy-five tons of high-grade ore per week.

STORMONT.—The cross-cut is running on the Thompson. The ledge is strong and well defined, showing up some fair-grade ore. As soon as the foot-wall is encountered, a drift will be run on the ledge.

VIRGINIA.

ROCKBRIDGE COUNTY.

LEXINGTON TIN COMPANY.—A charter has been granted to this company, which has a capital stock of $1,000,000. The company proposes to operate mines, build a railroad and tramways, and buy and sell lands. The company can not hold more than 50,000 acres. The principal office to be in Lexington, Rockbridge County.

WISCONSIN.

LALTER MINING COMPANY.—Articles of association have been filed by the incorporators, F. L. Kerr, of St. Paul; J. L. Gregory and E. J. Palmer, of Ashland; M. H. Greenly, of Minneapolis; and J. A. Ward, of Hurley. The capital stock is $500,000. Office at Ashland.

BULLION PRODUCTION FOR 1886—SPECIAL OFFICIAL REPORTS.

MINES.	States.	Month of January.	Year from Jan. 1st, 1886.
		$	$
Boston & Montana, G.	Mont.	81,583	.....
Caledonia, G.	Dak.	25,464	.....
Christy, S.	Utah	23,535	.....
Colorado Central, S.	Colo.	24,844	.....
Daly, S.	Utah.	§28,445	.....
Derbec Blue Grav., G. S.	Cal.	15,759	.....
Elkhorn, G. S.	Mont.	23,456	.....
Eureka, S. L.	Nev.	15,905	.....
Father de Smet, G.	Dak.	17,452	.....
Freeland, G. S. C.	Colo.	19,187	.....
Granite Mountain, S.	Mont.	113,600	.....
Hope, S.	Mont.	6,200	.....
Iron Hill, S.	Dak.	8,152	.....
Lexington, G. S.	Mont.	62,850	.....
Montana Limited, G. S.	Mont.	100,831	.....
Moulton, G. S.	Mont.	62,050	.....
New Pittsburg, S.	Colo.	2,060	.....
Ontario, S.	Utah.	144,212	.....
Plymouth Consolidated, G.	Cal.	55,683	.....
Plutus, G. L. C.	Colo.	24,627	.....
Ropes, G. S.	Mich.	3,151	.....
Standard Consolidated, G.	Cal.	19,309	.....
Tombstone, G. S. L.	Ariz.	*66,182	.....
Total		.....	.....

G., gold; S., silver; L., lead; C., copper; M., mica. Silver valued by the different companies from $1@$1.29 per ounce: gold, $20.67. *Not including value of lead and copper. †Royalty. ‡Net. §Ore sales. No shipments during month mentioned. ** Not official.

MARKETS.

Silver.

NEW YORK, Friday Evening, March 12.

DATE.	London. Pence.	N. Y. Cents	DATE.	London. Pence.	N. Y. Cents.
Mch. 6	46 11-16	102⅛	Mch. 10	46¾	102¼
8	46 11-16	102⅛	11	46¾	102¼
9	46¾	102¼	12	46 11-16	102¼

During February, the Secretary of the Treasury purchased 1,450,000 ounces of silver for coinage into standard dollars, being about 500,000 less than the usual monthly purchase. The price was higher, owing to the increased expenses of transportation during the bad weather.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 2 per cent. During the week, the bank lost £97,636 bullion; and the proportion of its reserve to its liabilities was raised from 46⅛ to 46½, against 47 per cent at this date last year. On

the 11th inst., the bank lost £15,000 bullion on balance. The weekly statement of the Bank of France shows a gain of 17,404,000 francs gold, and a loss of 1,673,000 francs silver.

Copper.—This market is very quiet, and there is no change to report in our quotations of last week: 11½c. for Lake and 10¼@10¾c. for Orford and Baltimore, the higher figures being for brands equal to Arizona. The market is very firm, and it is thought that the next sale to manufacturers here will be at higher figures. There is no rumor of any new contracts having been made abroad.

London quotations by cable to the Metal Exchange to-day quote Chili Bars £42 2s. 6d., and B. S. £45 10s.

On another page, we give Mr. Kirchhoff's statistics of copper production, which we discuss editorially. There is some reasen for believing that Mr. Kirchhoff's estimate of exports is too high, owing to the rather anomalous fact that the proportion of concentrates to matte exported is greater than that going to our own works. We are therefore inclined to believe that our exports were about as reported by us already, and that the home consumption was nearer 100,000,000 than 90,000,000 pounds.

Tin.—This market has been steady, with slightly higher figures, though without any material change. We quote here: 20·70@20·85c. for spot and March. Cable advices quote: Spot, £93 7s. 6d., and three months, £93 12s. 6d.

Lead.—The transactions in lead have amounted during the week to about 200 tons Richmond to arrive at 4·85c., and 200 tons foreign spot at 4·90c. No domestic lead is offering at these figures. Some foreign lead has been ordered, though probably not more than one or two thousand tons, and we hear of some of it having been resold on the other side. There is a fair probability that our own mines will supply nearly all the lead our market will take, provided the duty remains unchanged. London quotations to-day are for Soft Spanish £13 5s., and for English £13 15s.

Messrs. John Wahl & Co., of St. Louis, telegraph to us as follows to-day:

The railroad strike has assumed grave proportions. Freighting is practically stopped on all lines, and that shuts off principal arrivals of lead for the present. Hence the market is in a stagnant condition. The only sale during the week was 400 tons March Corroding at 4·75c. by a party having the lead here.

Messrs. Everett & Post, of Chicago, telegraph to us as follows to-day:

There is a fairly active demand for both hard and soft lead, and prices are held stiff. Buyers, fearing an advance, are coming to the front, and taking lead liberally. Sales for the week sum up over 600 tons at 4·80c. Offerings very light. The market closes at 4·80c. bid, 4·85c. asked.

Spelter.—There is nothing new in this metal, though the market is slightly stronger. Very little is now done in this market. We quote 4·50@4·75c., according to quality, for Domestic, and 5@5·10c. for Foreign.

The London market has declined somewhat, and is now quoted £14 12s. 6d. for Silesian at shipping ports.

The exports of calamine from Spain in 1885 were 32,485 tons, against 27,277 tons in 1884.

Sheet-Zinc remains at 5@5¼c.

Antimony.—This market remains quiet and steady at 8¼@8¾c. for Hallett's, and 9@9¼c. for Cookson's. London cables quote Hallett's £34 10s.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, March 12.

American Pig.—This market continues extremely quiet, and business only moderate. Prices remain unchanged at $18@$18.50 for No. 1 X; $17@$17.50 for No. 2 X; and $16@$17 for Forge, standard Lehigh brands, tide-water delivery. Special irons, such as Glendon, Chickies, and a few other brands, ask from $1@$2 more than these figures.

Scotch Pig.—This market is very dull, and may be quoted as follows: Coltness, $20.50@$21; Summerlee, $20; Dalmellington, $19; Eglinton, $18. Cables to the Metal Exchange to-day quote Coltness 47s.; Summerlee, 46s. 6d.; Langloan, 44s. 6d.; Gartsherrie, 43s.; Glengarnock, 45s.; Dalmellington, 42s. 6d.; Eglinton, 40s.; Freights are still high, about 7s. 6d.

Bessemer Pig.—But little business is done in this article. We quote $19 for Foreign, and $18.50@$19.50 for Domestic at the furnace.

Spiegeleisen.—The market is dull. We quote English 20 per cent nominally at $27; German, $26, as a week ago; 80 per cent ferro-manganese is quoted at $27.

Structural Iron and Steel.—There is nothing worthy of note in the market. A fair but quiet business in all kinds of manufactured iron is done, and prices remain unchanged. We quote Angles, 1·95@2·10c. delivered; Tees, 2·35c.; Iron Beams and Channels, 3c. for American from dock; and Belgian, 2·60@2·75c.

Plate Iron.—Common Tank, 1·95@2c.; Refined, 2¼c.; Flange iron, 3·4@3·5c.; Extra Flange, 4@4·25c.

Bar Iron.—Refined we quote at 1·85@1·95c.; Common, 1·60@1·70c. Store prices are 10@20c. higher.

Steel Plates.—We quote 2½c. for Tank; 3@3¼c. for Boiler and Ship Plates; 3¾@4c. for Flanges; 4¼@5¼c. for Extra Flange and Fire-Box Plate.

Merchant Steel.—Our quotations remain, American Tool Steel, 8@10c.; special qualities, 12@18c.; Crucible Machinery, 4½@5½c.; Bessemer and Open-Hearth Machinery, 2¼@2½c.

Old Rails are weak, and offerings are already coming in from Northern and Middle States. Small arrivals of foreign continue, but there is no encouragement to bring here what is already a drug in the market.

We quote Tees, $20.75@$21; Double-Heads, $21.50@$22, nominal.

Steel Rails.—We hear of sales of 12,000 tons in two lots at $34 and $35 at the mills, and of a few small lots at about the same prices.

On the 1st of March, the companies had sold about 806,000 tons, and there are a number of large orders still in the market. From this time out, the combination will practically be a dead letter, for most of the companies have already sold so nearly up to their full capacity that they are indifferent as to what the other mills do or contract for.

Were it not for the uncertainty of the tariff legislation, prices might easily be advanced, for the makers hold a very strong position.

The general impression is, that no change will be made in the tariff, owing to the differences in the views of the various cranks who are tinkering with it, none of whom will concede to the others, until, finally, they will conclude to "prefer the ills we know."

Philadelphia. March 11.

[From our Special Correspondent.]

The producers of the best brands of foundry iron are still saying that their predictions as to prices will be realized within thirty days, and that a general advance of 50 cents is assured, but there is very little evidence to support this view. To-day, buyers that are very well stocked up do not deny that the chances for the cheaper irons are against them, on account of the strikes, the advancing cost, and general labor complications; but they are quietly biding their time, and if they must pay better prices, they will do so when there is no escape. Some few brands are held as high as $19@$20, but very little business is done. Quite a number of inquiries are in hand for No. 2 iron, and the better prices have been paid for all that was bought, namely $17@17.50. Foundry irons are likely to hold their own, and there are encouraging indications everywhere for an enlarged demand. Contracts for Virginia irons are also solicited, and some little business has been closed. The mill owners are in a quandary. They have been unable to put prices up, although it is rumored to-day they may advance at their next meeting. It is doubtful, for the reason that too little business has been coming in during the past three or four weeks. Refined iron is worth $1.75 to $1.90, and makers are not able to sell at any thing less and come out even. There are orders for ten to fifty-ton lots coming in rather slowly, and storekeepers even report a falling off in their usual sales. The car-works have been buying some iron, but in such small lots that it does not affect the market.

Nails.—Nails have been suddenly strengthened in quotations at $2.40@$2.50, and considerable business is now in sight from buyers who have been waiting. Stocks are not large. All factories are running, so far as reported. Steel nails will be thrown in the market within two or three weeks.

Plate Iron.—Skelp iron is quoted firm at 1·80@1·85c.; Tank, 1·90@2·10c.; Plates, 1·90@2c. A fair amount of business has been done within the past six days.

Merchant Steel.—The monotonous reports of fair activity are reported this week.

Structural Iron.—Manufacturers of structural iron are in receipt of specifications this week for considerable business. They simply say that there is a large amount of work in sight that they will bid on during the next two weeks, and expect to have.

Steel Rails.—There is no particular activity in the steel-rail market, and quotations are repeated at $34@$35. There is a large amount of business in sight.

Old Rails.—Old rails are weakening. Heavy arrivals are looked for, and negotiations are pending for supplies for interior shipment, at $21 for Tees and $22 for Bull Heads.

Scrap-Iron.—The scrap yards are filling up, and business is dull. They are plenty of buyers around waiting for bargains, but will not pay present prices. Quotations are nominally $21 for No. 1 Scrap. Selected is held by some holders at $22. No. 2 Scrap is held at $15.

Pittsburg. March 11.

[From our Special Correspondent.]

Pig-Iron.—The demand has fallen off, that is, buyers are not so numerous, neither are they so anxious to invest. Most buyers are fairly supplied, and are disposed to wait until their stock is worked up. Opinions concerning the future differ. Buyers talk lower prices; sellers point to the advance in coke and freights; while there is no telling how soon another strike may be inaugurated. As a rule, prices have been well maintained, with the exception of Bessemer. We hear of sales of 1000 tons and 500 tons, at $20, 4 months, equal to $19.50 cash.

Gray Forge Iron.—Favorite brands are held firmly. We hear of sales at $16.25@$16.50 cash for city made iron. The latter is an advance of 25 cents. Less popular brands are selling a shade below these figures.

Anthracite Pig-Iron.—There is nothing doing here. The rates are entirely above the views of buyers. We have not heard of a sale for some time. It seems to have gone out of use so far as this market is concerned.

Iron Ore.—There is nothing doing at present. Dealers report a very dull market. Those who ought to know say that no improvement need be looked for just now. We note considerable receipts of foreign ore from Spain and Africa. This fact tends to keep down prices in this market.

Muck-Bar.—The advance noted has been maintained. Sales are reported at $28@$28.50 four months.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, March 12.

Statistics.

Production of Coke on line of Pennsylvania RR. for week ended March 6th, and year from January 1st: Tons of 2000 pounds.

	1886. Week.	1886. Year.	1885. Week.	1885. Year.
Allegheny Region.	4,134	33,602	3,721	34,449
West Penn. RR....	610	16,527	877	2,118
Southwest Penn. RR	42,039	233,551	35,340	323,586
Penn. & W. Region	7,936	60,562	6,056	50,645
Monongahela	2,524	9,790	1,638	12,261
Pittsburg Region.	.....	... .	.....	.....
Snow Shoe.....	929	7,354	253	3,410
Total....	58,172	361,386	47,885	426,469

The Norfolk & Western Railroad Company reports the shipments of Pocahontas Flat-Top coal for the week ended March 6th, 1886, and year from January 1st as follows, tons of 2000 pounds: 1886—Week, 13,354; year, 127,248. 1885—Week, 8,883; year, 86,093. Increase, 1886—Week, 4,471; increase, year, 41,155.

Production Anthracite Coal for week ended March 6th, and year from January 1st:

Tons of 2240 lbs.	1886. Week.	1886. Year.	1885. Week.	1885. Year.
P. & Read. RR. Co..	163,624	1,618,623	232,263	1,416,691
L. V. RR. Co.....	113,000	1,057,963	136,413	759,256
D. L. & W. RR. Co.	95,219	988,390	82,715	620,212
D. & H. Canal Co..	83,833	802,956	74,296	480,218
Penna. RR.:				
N. & West Br. RR.	24,012	243,880	17,775	189,942
S. H. & W. B. RR.	3,720	29,340	2,387	21,141
P. & N. Y. RR....	8,876	210,936	8,288	58,970
Penna. Coal Co.....	25,857	188,910	... .	78,083
Shamokin Div., N. C. RR	14,579	160,180	15,179	145,591
Lykens Valley.....	*9,000	80,587	9,410	81,368
Total...	541,720	5,381,765	578,726	3,851,472
Increase..	.....	1,530,293	....	.....
Decrease	37,006	.....	....	.....

* Estimated.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Production for corresponding period:

1881.....	4,687,291	1883.....	4,452,936
1882.....	4,111,780	1884.....	4,098,055

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	March 6.		March 8.		March 9.		March 10.		March 11.		March 12.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.	.....	.....	.....	.....	.....	.....	.....	.....	1.60	.....	.....	.....	100
Amie Con., Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argenta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bassick, Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belle Isle, Ne.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bodie Cons., Ca.	1.60	.....	.....	.....	1.50	1 40	1.45	.....	.....	.....	1.50	.....	1,250
Breece	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bulwer, Ca.	.62	.....	.55	.....	.65	.60	.....	.....	.....	.....	.....	.....	4,600
Cal., B. H.	1.25	1.10	1.25	1.20	1.05	1.00	1.00	.85	.90	.75	1.00	.90	6,800
Castle Creek	.06	.....	.....	.....	.07	.....	.....	.....	.....	.....	.....	.....	200
Chrysolite, Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Colorado Central	2.45	.....	2.50	.....	.....	.....	2.40	.....	.....	.....	.....	.....	1,300
Cons. Cal. & Va., Ne.	2.45	.....	2.40	.....	.....	.....	2.25	.....	2.25	.....	2.25	.....	2,100
Crown Point	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dunkin, Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eureka Cons., Ne.	.....	.....	1.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Father de Smet, Dk.	1.50	1.45	1.25	.95	1.25	1.00	1.00	.50	1.00	.80	1.30	1.20	4,920
Freeland	1.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	400
Gold Stripe, Ca.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gould & Curry, Ne.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand Prize, Ne.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Green Mountain, Ca.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hale & Norcross, Ne.	2.65	.....	2.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Hall-Anderson, N. S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Homestake, Dk.	.....	.....	.....	.....	.....	.....	18.00	.....	17.00	..	18.00	17.00	310
Horn-Silver, Ut.	3.25	3.20	.....	.....	3.00	.....	3 15	3.05	.....	.....	3.25	.....	1,111
Independence, Ne.	.....	...	.10	.....	.....	.....	.....	.....	.09	.....	.....	.....	1,100
Iron Silver, Co.	2.45	.....	2.50	2.45	2.40	.....	.....	.....	2.50	.....	.....	.....	2,100
Leadville C., Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.28	.....	500
Little Chief, Co.	.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,000
Little Pittsburg, Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Martin White, Ne.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Moulton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Navajo, Ne.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.40	.....	200
North Belle Isle, Ne.	.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,500
Ontario, Ut	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ophir	.....	.....	.....	.....	.....	.....	.90	.....	.....	.....	.....	.....	300
Osceola	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plymouth	.....	.....	15.00	.....	15.25	.....	15.50	15.38	.....	.....	.....	.....	50
Quicksilver Pref., Ca.	.....	.....	.....	.....	.....	.....	.....	.....	6.50	6.38	.....	.....	200
" Com., Ca.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Quincy	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Robinson Cons., Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Savage, Ne.	1.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	250
Sierra Nevada, Ne.	.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.75	.....	700
Silver King, Ar.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Spring Valley, Ca.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Standard, Ca.	.....	.....	.....	.....	.....	.....	1.00	.....	.....	.....	.....	.....	200
Stormont, Ut.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tip Top, Ar.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yellow Jacket	1.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	March 6.		March 8.		March 9.		March 10.		March 11.		March 12.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Albion	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
American Flag	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Barcelona, G.	.....	.....	.....	.....	.03	.....	.....	.....	.....	.....	.....	.....	1,500
Bechtel Con., G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belvidere	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belcher	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Best & B'icher, G. S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Big Pittsburg, S. L.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bowman Silver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bull-Domingo, S.L.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Central Ariz'na, S.	.....	.....	.....	.....	.....	.....	.....	.10	.09	.10	.....	.....	2,200
Chollar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cons. Imperial	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Con. Pacific	.....	.....	.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Cusi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Decatur	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Durango, G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eastern Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Goodshaw, G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harlem M. & M. Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harshaw	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kossuth	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lacrosse, G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mariposa Pref., G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" Com., G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mexican, G. S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mono	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Pittsburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Standard, G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. Horn-Silv'r, S L.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pri'nt'l & Miller, S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plutus	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Potosi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rappahannock, G	.13	.....	.....	.....	.13	.....	.....	.....	.....	.13	.....	.14	.13	8,300
Red Elephant, S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ridge	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Silver Cliff, S.	.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Sonora Con.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Bodie, G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Bulwer, G.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Hite	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Pacific	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
StateLine, 1 & 4, S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" Nos. 2 & 3, S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sutro Tunnel	.....	.....	.19	.....	.19	.....	.18	.....	.19	.18	.....	.....	6,700
Tamarack	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tioga	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Unadilla, S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union Cons., G. S.	.....	.....	.....	.....	.....	.....	.....	.60	.....	.60	.....	.....	600
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Dividend shares sold, 31,791. Non-dividend shares sold, 19,900.

Production Bituminous Coal for week ended March 6th, and year from January 1st:
Tons of 2000 pounds, unless otherwise designated.

EASTERN AND NORTHERN SHIPMENTS.

	1886. Week.	1886. Year.	1885. Week.	1885. Year.
Phila. & Erie RR.	94	366	.....	.....
*Cumberland, Md.	44,257	347,876	38,630	306,862
*Barclay, Pa.	4,051	38,413	6,517	51,271
*Broad Top, Pa.				
H. & Broad Top RR.	6,816	53,999	2,586	26,671
East Broad Top	.....	.....	.....	.....
Clearfield Region, Pa.				
Snow Shoe	3,136	26,977	4,943	39,343
Karthaus (Keating)	3,884	20,426	2,838	34,003
Tyrone & Clearfield	60,727	494,959	71,783	563,284
Allegheny Region, Pa.				
Gallitzin & Mountain	10,586	116,772	11,645	92,522
Total	133,551	1,099,788	138,942	1,113,956

* Tons of 2240 lbs.

WESTERN SHIPMENTS.‡

Pittsburg Region, Pa.				
West Penn RR.	4,507	41,815	4,553	46,099
SouthwestPenn. RR.	1,382	19,242	1,843	19,255
Pennsylvania RR.	3,030	39,506	5,658	41,886
Westmoreland Region, Pa.				
Pennsylvania RR.	28,741	261,335	25,719	208,636
Monongahela Region, Pa.				
Pennsylvania RR.	3,798	29,787	5,658	41,091
Total	41,458	391,685	43,431	356,967
Grand total	175,009	1,491,473	182,373	1,470,923

‡Considerable gas-coal shipped East, of which no division is made in report.

Anthracite.

Mild weather, excessive production, and a general lack of confidence have continued the softening process in prices. We do not learn of any lower prices than noted a week ago, but we hear of the lowest more frequently, and note fewer high quotations.

The least sanguine expected a coal combination long before this, and there is still a general belief that one will be formed; but the prospects at present are so very small for forming one soon that there is a good deal of despondency in the trade. The uncertain position of Reading has practically made negotiations to this end impossible. The other companies have been unwilling to commit themselves to an agreement with the present receivers of that company, who may, by the operations of the reorganization, be removed at the end of three months, thereby, perhaps, making a new agreement necessary under the new management. When the proposed plan is well understood, and when there are evidences that it will succeed, we think prompt work may be accomplished in the way of forming a combination; but not until that time. There is a feeling that, when such an arrangement is completed it will be a surprise to most of the trade.

The negotiations so far have developed the usual demand for 10 to 15 per cent more business than there is to give. Some companies are asking so much more than the others think they should have that an agreement can scarcely be arrived at. Experience has shown that, however small an allotment a company may ask for, an effort is always made to cut it down. We imagine that some liberal concessions will be made on a 34,000,000 ton basis when the time comes.

All the indications point to lower prices; still, it is probable that yards filled at the present ones and kept full, should a further decline occur, are bound to yield a handsome profit to the dealers before the end of the year.

For all the coal it sold f. o. b. vessels at Hoboken in February, the Delaware, Lackawanna & Western Railroad Company announces that it received an average of only about $2.68 a ton. This is the lowest average since 1879, the worst year in the trade, and is 13 cents under December and 26 cents under January. This will make tolls of $1.34 for individual operators on shipments from the mines to Hoboken. This, we understand, is 18 cents under the Lehigh Valley Railroad's charge on shipments from the Wyoming Valley, and may precipitate the reduction of tolls that has been expected from that company for two weeks past. Prices are so low that individual operators can not pay the tolls asked and get a new dollar for an old one, so that many of them have been compelled to shut down. As bad as this condition of affairs may appear for the individual operators, it is very much worse for the companies with their enormous fixed charges, which can only be met with great difficulty, if at all. There is no question but that the officers of some of these companies are becoming greatly alarmed at the prevailing conditions, and this is the most hopeful sign for future harmony and better prices.

We quote for ordinary free-burning coals f. o. b. as follows:

Lump	$2.70@$3.00
Steamboat	2.70@ 3.00
Broken	2.60@ 2.80
Egg	2.60@ 2.80
Stove	3.00@ 3.10
Chestnut	2.80@ 3.00
Pea	1.50@ 1.75
Buckwheat	1.20@ 1.50
Dust	1.00@ 1.10

Messrs. F. A. Potts & Co. have removed to No. 26 Broadway. The Lehigh Coal and Navigation Company has also gone to this address.

Bituminous.

The strike began on Monday. It is very mixed, and varies in its appearance each day. It is not nearly as strong as it was thought it would be. It was instigated by the Knights of Labor, who are in but comparatively small force in the various regions, and there are too many miners outside of that organization who know that they are receiving what should be very satisfactory wages. It is safe to say that the miners in the Clearfield and Cumberland districts are making from 25 to 40 per cent more a year than those in the anthracite mines, with not nearly so great risk of life.

The operators are showing a much greater determination to resist an advance than seemed likely two weeks ago. The low and declining prices of anthracite coal, and the largely increasing production of anthracite pea, buckwheat, and dust coal make this necessary. It is said that the Reading Coal and Iron Company alone produced 885,000 tons of pea coal last year, and that it will produce over 1,000,000 tons this year. The Lehigh Coal and Navigation Company produced over 27 per cent of pea and smaller sizes of coal last year. These sizes are selling in this market at $1@$1.75 a ton f. o. b. in this harbor, against $2.65@$3.25 asked for bituminous coal before the strike. The conditions of trade do not warrant an advance in wages now.

There is such a scarcity of bituminous coal at present that all of the well-known brands are entirely out of the market or held at fancy prices. For spot coal, $3.50 per ton can be readily obtained.

Freights from Philadelphia are quoted as follows per ton: To Boston, $1.10@$1.25 and discharge; to Baltimore, 58c. alongside; to Washington, $1@$1.05; to Norfolk, 60@70c.; to Charleston, $1.15; to Savannah, $1.40.

Buffalo.

March 11.

[From our Special Correspondent.]

Experiments looking for a supply of natural gas for Buffalo have uniformly been successful lately in our city and immediate neighborhood. There are now several gas wells with fair product and pressure located within ten miles. The last was at Gardenville, where a gas vein was struck which, on a match being applied, burst into a flame from 8 to 10 feet in length with a roar which told of many pounds of pressure.

Still another candidate for *enlightening* our city, The Queen City Natural Gas Company, was organized yesterday.

The opinion gains ground daily that the proposed

Buffalo & Geneva Railroad alluded to in my letter a few weeks since, will be the terminal line into Buffalo of the Lehigh Valley Railroad. There is no special demand, either for a freight or passenger line, between the points named for a new road. Geneva, being the terminus of the Geneva, Ithaca & Sayre Railroad, controlled by the Lehigh Valley, and which makes connection with that road's main line at Sayre, one mile below Waverly, would afford the most desirable point for continuing the Lehigh traffic facilities directly to Buffalo, thereby relieving it of its expensive contract with the New York, Lake Erie & Western Railroad.

No contracts have been made for carrying coal by lake on the opening of navigation thus far this season; and as far as can be ascertained, no prices have been named except probable or possible ones. Lake people must have something to talk about during the winter, but the question of coal freights at this port is generally tabooed until the near approach of navigation.

The Lake Carriers' Association had a large meeting at the Merchants' Exchange yesterday, elected their board of managers, and discussed many important topics, some of which may have a bearing upon the coal freighting rates later on, although interference with such matters is said to be ignored by the members.

"The coal trade is between hay and grass," says a dealer. "I have no news, and my brethren are equally uninformed."

The latest news to hand comes by way of Philadelphia, where a canvass of all the anthracite coal companies' agents on the subject of a combination elicits the fact that no meeting has been held lately for that purpose. Also that the Reading and Lehigh Valley companies are making strenuous efforts to get the Pennsylvania to join them in an agreement for the control of the trade this year. The Pennsylvania officials will consider a tonnage pool, but will not join a pool for the restriction of production.

Boston. March 10.

[From our Special Correspondent.]

The feeling among anthracite coal jobbers at this port is one of diminished hopefulness that the troubles will soon be cleared away. There are those who are beginning to assert that there will be no combination in the immediate future. The need of one is very urgent. There is much cutting of prices in the effort to secure orders, and the production is about 1,300,000 tons in excess of last year for January and February. The trade brought out by the cutting is, of course, largely speculative. If a combination is soon formed, the buyer at these low prices will be a decided gainer; but if the combination talk drags along and yields no fruit until considerably later, lower prices may be given; and if no combination is formed at all, then there may be a repetition of 1879 auction sales, and the bottom be knocked out entirely.

But taking the market as we find it, prices must be reported as unsettled and lower. For prices at New York, see New York report. It looks as if shippers desired to book all the orders they could at these prices.

March pocket prices have appeared, and show a decline of 25 cents on Stove and Nut, from 15 to 25 cents on Broken, and from 25 to 35 cents on Egg. They are: Hard White Ash, Broken, and Egg, $4.50; Stove, $5; Nut, $4.25; Pea, $3.50; Free-burning Broken, $4.25; Egg, $4.30; Stove, $5; Nut, $4.25; Lykens Valley Broken, $5.35; Egg, $6.35; Stove, $6.50.

There is a good demand for steam coal, but, owing to the strikes, the market is much disturbed. In view of the possibility of having to pay more for mining, shippers have been obliged to advance prices and retire temporarily from the market.

It is reported that the Old Colony has bought a portion of its coal. Very few large contracts remain out. More would be placed if dealers were as willing to make contracts as they were a few days ago. We quote, nominally, $2.15 as a f. o. b. price at Baltimore, and $2.25 at other ports. Delivered prices are in the vicinity of $3.35.

Freights are without movements of importance. Bituminous shippers have been troubled to fill contracts, on account of the delay of the fleet by bad weather, and considerable borrowing has been done.

We quote rates, exclusive of discharging:

New York, $1; Philadelphia, $1.25; Baltimore, $1.35; Newport News, $1.15@$1.20; Richmond, $1.25; Cape Breton, $1.60@$1.75; Bay of Fundy, $1.40@$1.50.

COAL STOCKS.

NAME OF COMPANY.	Par value of shares.	Quotations of New York stocks are based on the equivalent of $100. Philadelphia prices are quoted so much per share.												Sales from March 6th to March 12th, inclusive.
		March 6.		March 8.		March 9.		March 10.		March 11.		March 12.		
		H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Barclay Coal														
Cameron Coal	50	16⅜	14⅞	17	16	17	16¾	17⅛	16	17½	17	17½	16¼	17,222
Col. C. & I	10	27⅛	25½	27⅛	26½	27	25¼	25⅞	25⅛	26⅞	26	27½	26½	12,515
Ches. & O. RR	100	10¾										11	10¾	420
Consol. Coal	100													
Cumb. C. & I	100													
Del. & H. C	100	104⅝	103¾	105	103¾	103⅞	103⅛	103⅛	102	103¾	102¾	103	102⅛	20,756
D., L. & W. RR	50	130½	129⅝	130½	128¾	129⅛	128	128⅝	127⅛	129¼	127⅞	129¼	126¼	475,155
Elk Lick Coal Co														
Lehigh C. & N.†	50	51⅝	51⅜			51⅜	51⅛	51⅛	50⅞	51				1,083
Lehigh Valley RR.†	50	59				59½	59¼	59	58¼	58¾	58½			787
L. & W. C. & I. Co.														
Maryland Coal	100													
Montauk Coal	100													
Morris & Essex	50							139⅞		139		139⅛		149
New Central Coal	100	131⅛		123¾				127⅞						300
N. J. C. RR	100	55¾	55	55¾	54⅝	55	54⅛	54⅝	53⅝	55¼	54⅛	53¼	53⅜	53,817
N. Y. & S. Coal	50													
Penn. Coal	50													
Penn. RR †	50	55	54¾			54⅞	54¾	54¾	54⅛	54¾	54⅝			3,804
Ph. & R. RR.*	50	30½	29¼	31	29⅞	30¼	29½	29¾	28⅝	30¾	29⅜	30½	28⅝	606,037
Spring Mountain	50													
Westmoreland Coal†	50													

* Of the sales of this stock, 79,421 were in Philadelphia, and 526 616 in New York.
† The quotations for these stocks are not percentage, but actual price.

Total sales, 1,192,045.

There is nothing of importance to note in retail trade. Dealers are short of coal in some cases, owing to the delay of the fleet. We quote:

Franklin Egg and Stove	$7.00
Lorberry " "	6.50
Shamokin Egg	$5.50@ 6.00
Stove	5.75@ 6.00
Lehigh Furnace, Egg and Stove	5.25@ 5.50
Nut	5.50@ 5.75
White Ash Furnace and Egg	4.75@ 5.00
Stove and Nut	5.50@ 5.75
Cannel, American	10.00@12.00
English	14.00@15.00

Wharf prices: Broken, $4.25@$4.50; Egg, $4.25@$4.50; Stove, $5.

L. G. Burnham is about to erect new and large coal pockets on Mount Washington avenue, and has leased 100,000 feet of land for the purpose. The sheds will be built to hold 40,000 tons of coal. Mr. Burnham will give up his present wharf on Mount Washington avenue.

Pittsburg. March 11.

[From our Special Correspondent.]

There have been no river shipments since our last, on account of low water. Coal is plenty in the pools, with fully ten million bushels ready to leave on the first rise. Prices here are the same as last week. River wholesale on board, 4@5c. a bushel. Railroad, 4¼@4¾c. Pittsburg coal at Cincinnati afloat, 5@5¾c. a bushel. Kanawha, 5c. Ohio River, 4½c. Louisville afloat, 5@6½c.

Connellsville Coke.—No change is reported. Almost all the works are in full operation. Out of 10,832 ovens, 2340 are idle, classified as follows: Syndicate ovens shut down, 375; other pool ovens idle from strikes and other causes, 1290; furnace ovens, 500; old ovens, 177.

The Eastern trade has fallen off because of the advance in price, which has revived the use of anthracite.

The current prices are: Furnace Coke, $1.35 f. o. b. cars at ovens; Foundry, $1.50; Crushed, $1.80@$2 a ton.

Receipts of coal from the Monongahela River, January and February, 1886, in bushels:

	January.	February.
Pool No. 1	618,000	1,227,500
Pool No. 2	3,210,500	6,363,000
Pool No. 3	1,481,000	2,722,500
Pool No. 4	1,348,600	2,472,800
	6,658,100	12,785,800

Coke, Pool No. 2, January, 117,000 bushels; February, 99,000 bushels. Shipments of coal by Ohio River from Pittsburg since January 1st, 1886: January, 6,857,100 bushels; February, 12,785,800 bushels. Total shipments, 19,642,900 bushels of 76 pounds.

FINANCIAL.

Mining Stocks.

NEW YORK, Friday Evening, March 12.

The business of the mining market has been dull and devoid of all interest. The prices show no great change. The total transactions amounted to 51,691 shares, showing a decrease of 4084 shares, as compared with the preceding week.

The dealings in Caledonia and Father de Smet, which were prominent features of the market last week, have kept the same position, and continue to show a downward movement. The former opened at $1.25, closing at 90c. The lowest point reached was 75c. The latter ranged from $1.50 to 50c., and toward the end of the week went up again to $1.30. Homestake also shared with these stocks, declining in price, and went from $18 to $17.

Colorado Central has declared its seventh dividend, amounting to $13,750. The stock has been firm at from $2.50@$2.40; sales amounting to 1300 shares. Freeland showed a small business at $1.25. Iron Silver was active at from $2.40@$2.50, some 2100 shares changing hands. Little Chief shows a few sales at 26c. Silver Cliff, at 8c.

California stocks have been more active. Bodie was quoted at from $1.60@$1.40. Bulwer, at from 55@65c. Standard, at $1, and Consolidated Pacific at 15c. Plymouth Consolidated has been lower than in previous weeks, at from $15@$15.50. Quicksilver Common sold at from $6.50@$6.38.

The Comstocks have shown the usual transactions in the various stocks. Sutro Tunnel has been the most prominent at from 18@19c. Consolidated California & Virginia declined from $2.45@$2.25. Hale & Norcross was higher at from $2.60@$2.65. Among the other Nevada stocks, Eureka shows a small business at $1.90. North Belle Isle ruled at 30c. Independence, at 9@10c.

Only a few sales were made in Horn-Silver at from $3@$3.25. Alice, at $1.60. Central Arizona, at 9@10c. Rappahannock shows the largest business on the list, with steady prices at from 13@14c.

Eighty shares St. Louis Ore and Steel Company, $100 each, were sold at auction in this city on the 10th inst. for $1200 for the lot.

Coal Stocks.

The week under review has had no end of bad and good news, with the former predominating. Strikes, reduced dividends and rumors of them, disagreements between the Drexel-Morgan syndicate, and other detrimental influences, have finally caused a considerable slump.

The coal stocks were particularly weak this afternoon under an impression that the Gowen element had come into conflict with the Drexel-Morgan syndicate, with the chances very strongly in favor of a final disagreement.

The sales of Delaware, Lackawanna & Western were 475,155 shares at $130½@$126¼, closing at $126⅝. Reading, with transactions of 526,616 shares at $31@$28⅝, closed at $28⅞. Jersey Central was dealt in to the extent of 53,817 shares, at $55¾@$53⅜, closing at $54. The dealings in Delaware & Hudson aggregate 20,756 shares, at $105@$102, closing at $102⅝.

There has been a little activity in the bituminous coal stocks, but the strike is holding them down.

Meetings.

The annual and special meetings of the following companies will be held at the times mentioned:

Acadia Coal Company, No. 1 Broadway, Room 158, New York City, March 24th, at twelve o'clock M.

Conglomerate Mining Company, No. 205 Walnut Place, Philadelphia, Pa., March 18th, at twelve o'clock M.

Huron Copper Mining Company, No. 19 Congress street, Rooms 11 and 12, Boston, Mass., April 7th, at twelve o'clock M.

Mount Farm Coal Oil Company, No. 224 South Third street, Philadelphia, Pa., March 16th, at eleven o'clock A.M.

Peninsula Copper Mining Company, No. 78 Monroe street, Room 3, Chicago, Ill., April 1st, at eleven o'clock A.M., special meeting to consider the sale of 400 acres of timber and wood land belonging to the company and situated some distance from the mining plant; and to take into consideration the matter of mortgaging the company's property for the purpose of raising funds to work the mine.

Dividends.

Adams Mining Company, of Colorado, has declared a dividend (No. 21) of ten cents a share, or $15,000, payable March 20th, at the Farmers' Loan and Trust Company, Nos. 20 and 22 William street, New York City.

Barclay Coal Company, of Pennsylvania, has declared a dividend of three per cent on the stock of the company, payable March 18th, at No. 154 South Fourth street, Philadelphia, Pa.

Big Bend Hydraulic Mining Company, of Dakota, has declared a dividend (No. 26) of three cents a share, or $6000, payable March 20th, at No. 181 Broadway, New York City.

Boston & Montana Gold Mining Company, of Montana, has declared a dividend (No. 21) of fifteen cents a share, or $30,000, payable March 20th, to stockholders of record March 12th, at No. 30 Broad street, New York City.

Colorado Central Consolidated Mining Company, of Colorado, has declared a dividend (No. 7) of five cents a share, or $13,750, payable April 10th.

Iron Hill Mining Company, of Dakota, has declared a dividend (No. 2) of five cents a share, or $12,500, payable March 10th, at Deadwood, Dakota.

Holmes Mining Company, of Nevada, has declared a dividend (No. 2) of twenty-five cents a share.

Lehigh Valley Railroad Company has declared a quarterly dividend of one per cent on the capital stock, payable April 15th, at 228 South Third street, Philadelphia, Pa.

Pipe Line Certificates.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows for the week:

The market in crude petroleum for the past week shows more activity and change in prices than for some time past, having sold as high as 80½c., and as low as 77¼c. The break in prices recorded Thursday was due to the coming in of a new well, known as the Emerson, and located on the Manifold Farm in Washington County. It is said to be doing at the rate of fifty barrels per hour, which, if it can be sustained, would prove quite a factor in the crude market. The feeling is unsettled, and the short interest has been increased.

The following table gives the quotations and sales at the Consolidated Stock and Petroleum Exchange:

	Opening	Highest.	Lowest.	Closing.	Sales.
March 6	79⅜	79⅝	78¾	79½	2 965,000
8.....	79	79⅝	78¾	79¼	2.370.000
9.....	79½	80⅛	79⅛	80¼	2,774,000
10.....	80	80⅜	79½	80	2,875,000
11.....	80⅛	80½	77¼	78⅛	9,985.000
12.	77¾	78½	77¼	77⅜	4.556,000
Total sales.					25,525,000

Boston Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, March 11.

The market has ruled dull for mining stocks the past week, with a tendency to lower prices. There has been no pressure to sell the copper stocks, and, in the absence of buying orders, the market has been a tame one, with, however, a little firmer tone the past two days. We still expect to see a great deal of activity during the next two or three months, and predict much higher prices for the whole list. In Calumet & Hecla, the orders have been for small lots for investment, and we have to note a decline from $230@$227, with a slight rally to $227½; sales 71 shares. Quincy has been very firm, and all the sales in small lots at $50, same as last week. Franklin, steady at $13⅜@$13½, with sales of 425 shares. Osceola sold at $17, small lots only. Atlantic, firm at $11. Huron declined from $2⅜@$2⅛, but is in better demand at $2⅜ bid, $2¾ asked; sales, 585 shares. Pewabic sold at $2¾. Ridge declined from 75 cents, on the announcement of an assessment of 50 cents a share, to 37½ cents, at which price it is in demand; sales, 450 shares. Arnold sold at 40 cents, same as last week. Allouez declined from $1 7/16 to $1. Total sales of copper stocks for the week, 2120 shares.

In silver stocks, there has been but little doing; sales of Bonanza at $1⅜. Catalpa, 35@32½c. Boston & Montana, $7. Brunswick Antimony has again put in an appearance after a long period of inactivity. The company has been reorganized, assessed $5 a share, sold at $7, and advanced to $12, with sales of 775 shares.

At the Boston Mining and Stock Exchange, there has been little doing in mining stocks, and prices show but little change. Bowman Silver declined to 12½c. Dunkin, dull at 36@39c. Catalpa, 35@36c. Empire, firm at 8c. Milford Mining and Milling, steady at 60@62c. Miscellaneous stocks dull and heavy.

3 P.M.—Calumet & Hecla, $228@$230; Franklin, $13@$13½; Osceola, $16⅞; Quincy, $49¾@$50; Tamarack, $88; Atlantic, $10½; Brunswick Antimony, $12¼@$14½.

San Francisco Mining Stock Quotations.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Mar. 5.	Mar. 6.	Mar. 8.	Mar. 9.	Mar. 10.	Mar. 11.
Albion						
Alpha						
Alta	.35		.35	.30	.30	.30
Argenta						
Bechtel						
Belcher				1.00		
Belle Isle						
Best & Belcher	1.62½	1.50	1.37½	1.37½	1.50	1.37½
Bodie	1.50	1.50	1.50	1.50	1.50	1 50
Bullion						
Bulwer	.60			.60	.55	
Chollar	1.12½	1.00	1.00	1.00	1.12½	1.12½
Con. Pacific	.25		.20	.20	.20	.15
Con. Cal. & Va.	2.37½	2.37½	2.50	2.12½	2.25	2.25
Crown Point	1.12½		1.12½	1.12½		1.12½
Day						
Elko Cons						
Eureka Cons	2 00	2.00				
Exchequer						
Gould & Curry	1.00	1.00	.85	.75	.95	.80
Grand Prize						
Hale & Norcross	2.12½	2.00	1.75	1.75	2.00	2.00
Independence						
Martin White						
Mexican	.45	.45	.45	.40	.40	.40
Mono	4.00	4.00	4.00	4.00	3.87½	3.87½
Mount Diablo	3.75	3.75	3.62½			3.75
Navajo	.35	.35		.25	.25	.2
Northern Belle						
North Belle Isle						
Ophir	.65	.65	.90	.85	.90	.90
Overman						
Potosi	.40	.40	.75	.70	80	.75
Savage	1.12½	1.12½	1.00	1.00	1.12½	1.12½
Scorpion						
Sierra Nevada	.75	.75	.70	.70	.70	.70
Silver King						
Tip-Top						
Union Cons	.60	.60	.55	.50	.55	.50
Utah					.70	
Wales Cons						
Yellow Jacket	1.00	1.00	1.00	.90	.95	.90

DIVIDENDS.

PLYMOUTH CONSOLIDATED GOLD MINING COMPANY, 23 NASSAU STREET.
NEW YORK, Feb. 26, 1885.
DIVIDEND NO. 34.

The Board of Trustees have declared a dividend of TWENTY-FIVE THOUSAND DOLLARS, the same being *twenty five cents* per share of the capital stock of the company, payable on the fifth day of March, at the Company's offices in New York and San Francisco.

W. VAN NORDEN, President.

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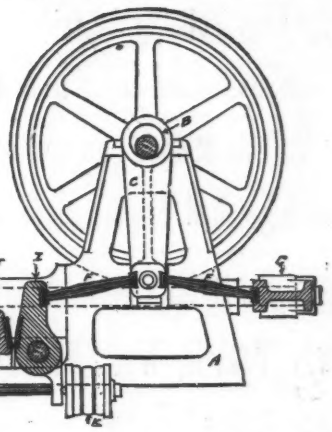

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	9		2.25	5.84	15.84	27.63	37.71	47.17
	12	1	3.00	7.46	20.04	34.70	47.03	60.00
	15		3.66	9.28	24.49	42.42	57.49	73.35
	18	1½	4.33	10.78	28.95	50.14	67.96	86.70
	21		5.00	12 44	33.41	57.86	78 42	100.05
	24	2	5.67	14 10	37.87	65.59	88.89	113.40
	27		6.29	15.58	41.85	72 48	98 23	125.32
	30	2½	6.86	17.07	45.83	79.38	107.58	137.25
¼ Column.	33		7.45	18.55	49.81	86.28	116.93	149.17
	36	3	8.05	20.04	53.80	93.18	126.28	161.10
	39		8.58	21.37	57.38	99.38	134.68	171.82
	42	3½	9.12	22.70	60.97	105.58	143.09	182.55
	45		9.66	24.03	64.55	111.78	151.49	193.27
	48	4	10.20	25.37	68.14	117.99	159.90	204.00
	54	4½	11.17	27.79	74.64	129.27	175.19	223.50
	60	5	12.15	30.22	81.15	140.55	190.48	243.00
⅜ Column.	66	5½	13.05	32.46	87.16	150.96	204.58	261.00
	72	6	13.95	34.70	93.18	161.37	218.69	279 00
	78	6½	14.84	36.81	98.84	171.17	231.97	295.95
	84	7	15.74	38.92	104.50	180.97	245.26	312.90
	90	7½	16.51	40.95	109.95	190.42	258.03	329 25
	96	8	17.28	42.99	115.40	199.87	270.81	345 60
½ Page.....	102	8½	18.09	45.01	120.85	209.28	283.55	361.75
	108	9	18.90	47.03	126.28	218.69	296.29	377.90
	114	9½	19.72	49.07	131.77	228.19	309.19	395.45
	120	10	20.55	51.12	137.26	237.70	322.15	411.00
	126	10½	21.41	53.26	143.02	247.68	335.67	428 25
⅝ Page.....	135	11¼	22.25	55.40	148.75	257.65	349.20	445.50
¾ Page.....	204	17	32.25	79.20	218.00	374.65	503.10	633.50
Full Page..	408	34	61.00	147.45	407.50	705.75	966.40	1220.25

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This Method has received the indorsement of the most distinguished Engineers in America.

Estimates furnished for laying Double or Single Railway Tunnels, Water Mains, or Tube across Rivers or out into Lakes.

Fig. 1

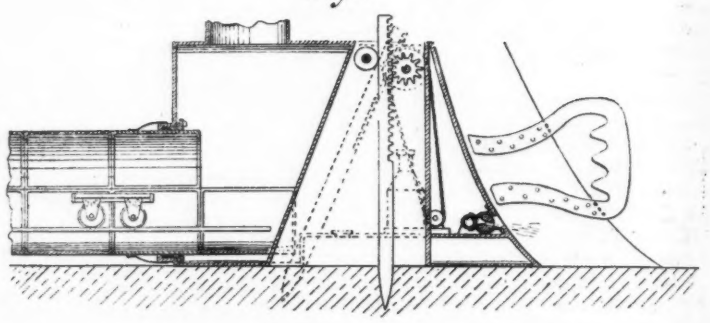
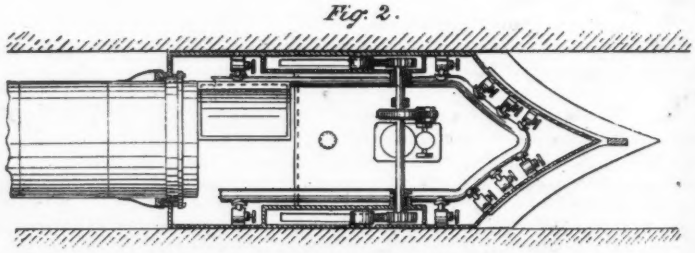
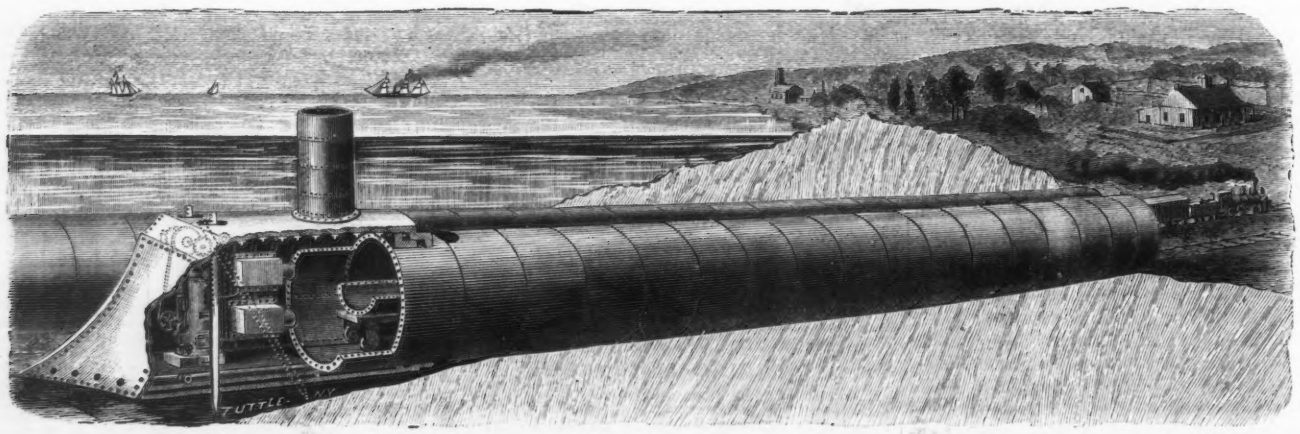


Fig. 2.





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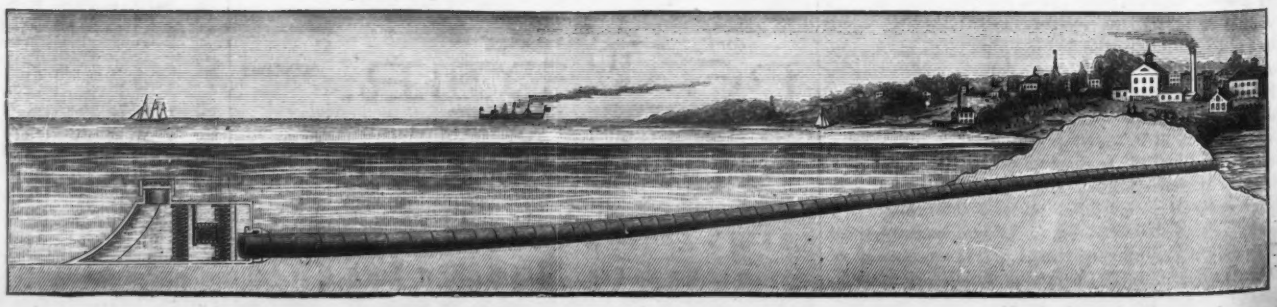
This cut represents a tunnel laid out into a lake, caisson arranged for a filterer, that can be cleaned at will. Mains from 30 inches to 10 feet can be laid at any depth or distance by this system.